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THE ANATOMY OF THE Human Body.

With XXXIV COPPER-PLATES.

BY

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Of all God's Works that do this World adorn,
There is not one more fair and excellent,
Than is Man's Body both for Power and Form.

SPENSER.

The THIRD EDITION.

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TO

Dr. *Richard Mead*,

FELLOW of the College of
Phyſicians in LONDON,
And FELLOW of the
ROYAL SOCIETY.

SIR,

EVERY part of PHYSICK may juſtly preſume on your protection, to whom it owes ſo

much improvement. ANATOMY in particular has received ſuch advantage from your LECTURES, that it were a kind of injuſtice not to dedicate all endeavours in that way to you; in me indeed it would be unpardonable not to offer the fruits of thoſe ſtudies, which at firſt began, and have ſtill been carried on with your encouragement. The kind reception my induſtry has met with, is owing to you, the authority of whoſe opinion

pinion has in every place ſecured me ſo much favour; eſpecially in that ſeat of learning, which with diſtinguiſhed honours rewarded your merit.

I am,

SIR,

Your moſt obliged and

obedient humble Servant,

W. CHESELDEN.

THE

PREFACE.

THIS treatise being designed for the use of those who study ANATOMY, *I have disposed it in the same order in which it is usually taught. The bones first, and then the muscles, because the knowledge of the bones is necessary to the knowledge of the muscles; and afterwards the vessels, because their situations*

are chiefly described by the bones and muscles, near which they are situated. But before we shew the vessels in the limbs, we find it necessary to shew the parts in the three cavities, which I have endeavoured to do in that order which is most convenient to dissect in, and fittest for the explanation of the animal œconomy: But the parts of generation, and the five senses, being fit to be considered separately, they are all done in a distinct book.

IN describing of the parts, I have pretty much neglected the Minutiæ *in* ANATOMY: *Nor have I been very particular about those things which cannot be understood without being seen, and being seen need little description; but have endeavoured to*

be more explicit about those which are of greatest use in PHILOSOPHY, PHYSIC, *aud* SURGERY: *And I could wish the dividing and distinguishing of parts were usually done with more regard to these valuable ends.*

I MUST here acknowledge my obligations to Mr. Monro, *professor of* ANATOMY *at* Edinburg, *who, besides those excellent chapters of the* Ductus Thoracicus *and the nerves, with other passages acknowledged in their respective places, has sent me so many remarks upon the former edition, that there are but few pages in this, which are not the better for him: And it being justly esteemed an hardship, that books should be reprinted with additions*

tions, without printing the additions ſeparate, for the uſe of thoſe who have the former editions, and theſe corrections and additions of Mr. Monro's, *with others of my own, being ſuch as could not be conveniently printed by themſelves; I have therefore taken care that the books of the former editions (though ever ſo much defaced or imperfect) may be changed for this at two ſhillings in ſheets.*

THE fifteen plates which were in the firſt edition I ſhould have made entirely new, if I had not been ſo much engaged about an Oſteology, in which every plate is twenty one inches long, and fifteen broad. All the bones will be done as large as the life, and the bones of the limbs

and

and trunk, with ſceletons as large as the plates will admit of: And beſides theſe there will be ſome plates of the cartilages, ligaments and diſeaſed bones; and every chapter will have a diſtinct head-piece and tail-piece, which will be chiefly made of the ſceletons of different animals; and in what manner this will be performed Tab. x. page 69. *is offered as a ſpecimen.*

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THE

THE ANATOMY OF THE Humane Body.

The General Introduction.

IT is a received opinion, that an animal body is, a Compages of veſſels, variouſly diſpoſed, to form parts of different figures, for different uſes.

THE ancients ſuppoſed, that the heart and brain were firſt formed, and that all the other parts proceeded from them, and that all membranes were derived from the Dura Mater, or Pia Mater of the brain. They diſtinguiſhed all the parts into ſpermatic and ſanguineous,

guineous; and frequently engaged themſelves in diſputes about the derivation of parts; with many other things of the like nature, conſequences of their Hypotheſis. But the moderns, aſſiſted with glaſſes, have diſcovered, that all the parts exiſt in miniature, from the firſt formation of the Fœtus; and that their increaſe, is only the extenſion and thickning of their veſſels, and that no part owes its exiſtence to another.

Thus much I thought neceſſary to premiſe, that the reader might have a general idea of the body, and that he may ſee for what reaſon no notice is taken in this treatiſe of ſome diſtinctions and diviſions of parts, uſed by ancient Anatomiſts, and thoſe who have copyed after them.

The conſtituent parts of the animal body, are, Fibres, Membranes, Arteries, Veins, Lymphæducts, Nerves, Glands, Excretory Veſſels, Muſcles, Tendons, Ligaments, Cartilages and Bones; to theſe may be added the Hair and Nails, though they ſeem to have only a vegetative kind of life.

Fibres, as they appear to the naked eye, are ſimple threads of the minuteſt blood veſſels or nerves, or both, which enter into the compoſition of every part.

Membranes, are Compages of fibres, expanded, to cover, or line any other part.

The

THE arteries, are tubes that arise in two trunks from the two ventricles of the heart, and thence dividing into branches, distribute the blood to every part of the body.

VEINS, are tubes to return the blood from the extremities of the arteries to the heart.

LYMPHÆDUCTS, are pellucid tubes to carry lymph from all parts, especially the glands, which they discharge into the larger veins, and into the Vasa Lactea.

NERVES are Fasciculi of cylindrical fibres, which arise from the Medulla Oblongata of the brain, and the Medulla Spinalis, and terminate in all the sensitive parts. They are the immediate organs of sensation.

A GLAND secretory, is composed of an artery, vein, lymphatic, excretory duct, and nerve. The use of glands is to secrete fluids from the blood for several uses.

EXCRETORY-VESSELS, are either tubes from glands to convey the secreted fluids to their respective places, or vessels from the small guts, to carry the chyle to the blood-vessels; these last, are call'd Vasa Lactea.

MUSCLES, are distinct portions of flesh, which, by contracting, perform the motions of the Body.

TENDONS, are the same fibres of which the muscles are composed; but white and more closely connected, that they may possess less

ſpace in a limb, and be inſerted in leſs room into a bone.

LIGAMENTS, are ſtrong membranes, or bodies of fibres cloſely united, either to bind down the tendons, or give origin to the muſcles, or tie together ſuch bones as have motion.

CARTILAGES, or griſtles, are hard, elaſtic, ſmooth and inſenſible: Their uſe is to cover the ends of the bones that have motion, to prevent their attrition, &c.

BONES, are firm parts to ſuſtain, and give ſhape to the body.

THE hair and nails are ſufficiently known; the former ſeems to be nouriſhed from the Materia Perſpirabilis, and the latter from the Reticulum Mucoſum, betwixt the Cutis and Cuticula.

BOOK I.

CHAP. I.

Introduction to the Bones.

THE use of the bones is to give ſhape and firmneſs to the body, to be levers for the muſcles to act upon, and to defend thoſe parts from external injuries that are of greateſt conſequence to be preſerved, as the brain, heart, &c.

THEY are in their firſt ſtate very ſoft fibres, till by the addition of a matter, which is ſeparated from the blood into them, they grow by degrees to the hardneſs of a cartilage, and then perfect bone: But this great change is neither effected in a very ſhort time, nor begun in all the parts of the ſame bone at once. Flat bones, that have their fibres directed to all ſides, begin to oſſify in a middle point; but thoſe that have their fi- Tab. v. C.
bres nearly parallel, begin in a tranſverſe middle line, that is in the middle of each

 fibre;

fibre; and ſo the cylindrical bones in a middle ring, from which they ſhoot forth to their extremities. By the continual addition of this oſſifying matter, the bones increaſe, till their hardneſs reſiſts a farther extenſion, and becauſe their hardneſs is always increaſing while they are growing, the increaſe of their growth becomes ſlower and ſlower, till they ceaſe to grow at all; and at length in old or weak perſons, if I am not miſtaken in my obſervations, they decreaſe as well as the fleſhy parts, though not ſo faſt, by reaſon of their hardneſs. And though I think it would be difficult to prove this, yet the poſſibility of it at leaſt will ſufficiently appear from the following caſe. A ſoldier that from a ſhot in his left groin, had the head of the Os Femoris broke, part of which came away through the wound, upon which the limb waſted, and he dying of an Anaſarca about a year after, I found the Os Femoris waſted about an inch in length, but ſo much in its thickneſs, that when they were both dried and ſawed lengthways through their middles, the emaciated bone weighed thirty grains leſs than half the weight of the other thigh bone: From the appearance of this man, and the firm connection of all the bones with their Epiphyſes, I am perſuaded he muſt have done growing before he receiv'd this wound; therefore, unleſs he

was

was taken lame into the ſervice, which cannot be ſuppoſed, this bone muſt have waſted about thus much in that time. The oſſifying matter of the bones is ſo well directed to them by ſome wiſe law, that I have ſeen but one inſtance of a bone in an adult body unoſſified, which was ſo much of one ſide of the lower jaw as is beyond the teeth; but bony excreſcences upon the bones are frequent, and even the fleſhy parts, eſpecially in old perſons, are ſometimes oſſified. In an old man that died of a mortification in his leg, I found all the arteries of the legs bony, eſpecially between the diviſions of the branches, and many parts of the Aorta. But the moſt conſiderable inſtance of this kind that I have ever found, is in part of the muſcular fibres of the heart of a man, nearer its Vertex than the baſe, as large as a ſixpence, perfectly oſſified. And though it might ſeem that the bones, while they appear cartilaginous, differ from perfect bones only in hardneſs, yet in a child two years old that I kept in vinegar, all the bones grew near as ſoft and pliable as the fleſhy parts, though the ſkin in ſeveral places was not taken off; yet the cartilages and cartilaginous Epiphyſes of the bones were but little altered. Tab. vi. F. 1.

BONES that are without motion, as thoſe of the ſcull, the Oſſa Innominata, &c. alſo bones

with their Epiphyses, when they meet, press into each other, and form sutures, which soon disappear in those that join, while their ossific matter is soft; but those that grow harder before they meet, press more rudely into each other, and make more uneven sutures, some of which in the scull endure to
Tab. iii. 1, 2. the greatest age; and very often the ossific matter not flowing far enough to complete a bone, the part uncompleted has an ossification begun in its center, and is formed into a distinct bone, which may happen to be of any figure. These bones are ofteneſt found in
Tab. iii. 29. the lambdoidal suture, and are called Ossa Triquetra. But the ends or sides of bones that are intended for motion, are hindered from uniting, by the cartilages which cover them; for when these cartilages are destroyed
Tab. vi. E. they very readily unite; this distemper is called Ancylosis.

THE ends of all the bones that are articulated for very manifest motions, or that are not placed against other bones, are tipped with
Tab. v. 1, 2. 3. Epiphyses, or additional bones, which in some measure determine their growth and figure; for if they had nothing to give bounds to them, they would shoot out like the Callus from the broken ends of a bone that is not set, and grow more ragged than the edges of bones which are joined by sutures; and sometimes

ſometimes Epiphyſes are made uſe of to raiſe proceſſes upon bones for the inſertions of muſcles, as the Trochanters of the thigh bones, where it would weaken the bones too much to have proceſſes raiſed out of their ſubſtance. Tab. ii. 16, 17.

THE fibres of bones, for ought that we can diſcover from experiments or microſcopical obſervations, appear to be connected to each other by the ſame means that the ſeveral parts of a fibre are connected, that is, by that ſtrong attraction which belongs to particles of matter in contact: But this coheſion of fibre to fibre is not equal to that in the parts of a fibre, though very nearly. Indeed, if it was, a bone would not be a ſtructure of fibres, but one uniform maſs, like that of any pure metal, the coheſion of the parts of which are every way alike: Nor are the parts of bones diſpoſed into Lamellæ, Stratum ſuper Stratum, as G----di, and others have painted; for though young bones may in ſome places be ſplit into Lamellæ, yet they not only appear one ſolid uniform maſs to the naked eye, but even with a microſcope, till we come to their inner ſpongy texture, which alſo appears uniform.

THE texture of the bones when firſt formed, is every where looſe and ſpongy, but as they increaſe, they become in many places very compact and denſe, which reſults in great

great meaſure from the preſſure of the bellies of the muſcles, and other incumbent parts; as appears from the impreſſions which are made on the ſurfaces of the bones, and the rough ſpines that riſe on the bones in the interſtices of the muſcles, which are very remarkable in the bones of men who have been bred up in hard labour. In thoſe parts of the flat bones that receive but little preſſure, the outer Laminæ only become compact and denſe, and the middle part remains ſpongy; but where the preſſure is great, they become one denſe body or table; and this preſſure is ſo effectual, that ſome parts of the Scapula, and the middle of the Ilium, are uſually thinner in an adult body than in a child before it is born. The cylindrical or round bones being preſſed moſt in their middle, become there
Tab.v. D. very hard and ſtrong, while their extremities grow ſpongy, and dilate into large heads, which make ſtronger joints, and give more room for the origins and inſertions of the muſcles; and increaſe the power of the muſcles, by removing their Axis farther from the center of motion of any joint they move.

All the bones, except ſo much of the teeth as are out of the ſockets, and thoſe parts of other bones, which are either covered with cartilage, or where muſcles or ligaments ariſe or are inſerted, are covered with a fine

a fine membrane, which upon the ſcull is called Pericranium, elſewhere Perioſteum; one uſe of which is for the muſcles to ſlide eaſily upon, and to hinder them from being lacerated by the roughneſs and hardneſs of the bones. This membrane is ſaid to be exceeding ſenſible of pain, which, I ſuppoſe, is imagined from the pain that a blow on the ſhin gives: but it ſhould be conſidered how much greater the contuſion is in that caſe, from its lying upon a hard body; for this is certain, that when we cut this membrane, or ſeparate it from the bone, as we do, to prepare for the operation of the Trephine; the patient never diſcovers any extraordinary uneaſineſs, and that great pain which is ſometimes felt at the ſawing the bones or a bone in an amputation, is when the teeth of the ſaw touch the great nerves that always lie near the bones, and not from the Perioſteum; for if it proceeded from that, this complaint would be more conſtant, and at leaſt as great at the firſt ſetting on of the ſaw, or at the laſt ſtroke, as at any other time.

In a body that I diſſected, who died of a ſpotted Fever, I found in many of the bones extravaſated blood; and in ſeveral places, particularly on the Os Humeri, and Os Femoris, a large quantity of blood between the Perioſteum and the bones. I imagine it may

be from ſuch extravaſations of blood that carious bones ſometimes follow violent fevers, and the ſmall-pox.

In children that have died of the rickets, I have always found the nodes on the bones very ſpongy and bloody, and in one inſtance ſeveral of the bones as limber as leather, and the Perioſteum in many places ten times its natural thickneſs; but the cartilages in all that I have diſſected, have had no apparent alteration in their texture, though they were ſwelled to more than four times their natural bigneſs.

Tab. v. D. Every cylindrical bone has a large middle cavity, which contains an oily marrow, and a great number of leſſer cells towards their extremities, which contain a bloody marrow; this bloody marrow is alſo found in all ſpongy cells of bones. The uſe of the firſt kind of marrow is to ſoften, and render leſs brittle the harder fibres of bones among which it is ſeated; and the other marrow is to be of the ſame uſe to the leſs compact fibres, for an oily marrow might have made them too ſoft; and for this reaſon, there is leſs of the oily marrow, and more of the bloody in young bones than in old ones. Every one of theſe cells is lined with a fine membrane, and the marrow in the larger cells is alſo contained in thin membranous veſicles, in which membranes

branes I ſuppoſe thoſe veſſels lie that ſecrete the marrow; if the bones had been formed of the ſame quantity of matter without any cavities, they would if they were ſtreight be able to ſuſtain the ſame weight that they now can: But they being made hollow, their ſtrength ſo as to reſiſt breaking tranſverſly is encreaſed as much as their diameters are encreaſed, without encreaſing their weights, which mechaniſm being yet more convenient for birds, the bones of their wings, and for the ſame reaſon their quills have very large cavities. But the bones in the legs of all animals are more ſolid, being formed to ſupport weight; and mens bodies being ſupported but by two limbs, the bones of their limbs, are therefore made more ſolid than thoſe of quadrupeds. But in a fractured bone, in which the ſame kind of matter that oſſified the bones at firſt, is thrown out from the ends of the broken bone, there is made a maſs of callous matter, of equal ſolidity with any part of the bone, and of equal or greater diameter; which will make the ſtrength of the bone in that place greater than it was before: And if we conſider, we ſhall find this a very wiſe proviſion, for bones when broke, are ſeldom or never ſet in ſo good a direction as that in which they were firſt formed, and therefore they would be more liable to be broke in the

ſame place again, and would be reunited with greater difficulty, and ſometimes not at all, becauſe the Callus not being vaſcular, would ſcarce admit the oſſific matter to flow through it to form a new Callus.

THE names of the articulations of the bones being variouſly uſed by authors, and being but of ſmall conſequence, I give the ſhorteſt account that I can of them. An articulation for manifeſt motion, is called Diarthroſis; for obſcure motion, Synchondroſis; and that kind which is without motion, Synarthroſis.

DIARTHROSIS, is divided into two kinds, viz. Enarthroſis and Ginglymus. Enarthroſis is where a round head is received into a round cavity, which mechanicks call the ball and ſocket; though none of the articulations in a humane body fully reſemble that, unleſs the upper end of the thigh bone, with the Os Innominatum. Ginglymus is always deſcribed by authors to be where a bone receives, and is received, which is right, where they are joined ſomewhat like hinges, as the oblique proceſſes of the Vertebræ of the loins, where authors uſually take two joints to make a Ginglymus, that it may anſwer their deſcriptions, though any one of thoſe joints is a true Ginglymus. But in the other Vertebræ, and in the articulation of the Ulna, with the Os Humeri,

Humeri, and that of the Radius with the Ulna, there being only the motion of hinges, without the form to give theſe joints this denomination; we may for the ſame reaſon call every joint a Ginglymus, whoſe property is only to bend and extend, as the knee, ankle, &c. And what makes it more neceſſary to bring theſe joints under this head, is, that they are reducible to no other.

Synchondrosis, is by intervening cartilages or ligaments, as between the bodies of the Vertebræ; but the trueſt Synchondroſis is the joining of the ribs to the bone of the Sternum.

Synarthrosis, is of two ſorts, viz. Sutura and Gomphoſis. The firſt kind is the mutual indentation of one bone with another, as is eminently ſeen in the ſcull, and the other the faſtening of the teeth in their ſockets, like a nail in wood.

CHAP. II.

Of the Sutures and Bones of the Head.

Those Sutures which have proper names, are here deſcribed; thoſe which have not, derive their names from the bones they ſurround, and are known by them.

Sutura

Tab.iii. 1. SUTURA CORONALIS, runs acroſs the ſcull, and joins the parietal bones to the frontal.

Tab.iii. 2. SUTURA SAGITTALIS, joins the parietal bones; it begins at the Os Occipitis, and is continued to the Os Frontis; in children down to the noſe; the Os Frontis in them being two bones, and ſometimes ſo in adult

Tab. v. bodies.

Tab.iii. 3. SUTURA LAMBDOIDALIS, joins the back part of the Oſſa Bregmatis, or parietal bones, to the upper part of the occipital: In this ſuture are frequently obſerved ſmall bones,

Tab. iii. 29. called Oſſa Triquetra.

Tab.iii. 4. SUTURA SQUAMOSA, is made by the wrapping of the upper part of the temporal and ſphenoidal bones over the lower edges of the parietal bones.

Tab.iii. v. SUTURA TRANSVERSALIS, runs acroſs the face, through the bottoms of the orbits of the eyes; it joins the lower edge of the frontal bone to the Os Sphenoides, Maxillæ Superioris, Oſſa Ungues, Palati, Plana, and Jugalia, or Malarum.

THE ſcull being thus divided into many bones, is neither ſo ſubject to fractures, nor to have fractures ſo far extended, as it would have been were it compoſed of one bone only. This ſtructure is alſo convenient for the oſſification of the bones (as has been ſhewn in the firſt chapter) and for the birth, becauſe

becauſe theſe bones not being perfect at that time, may be preſſed together and make the head leſs.

TEN of the bones of the head compoſe the ſcull to contain the brain. Theſe ſhall be firſt deſcribed.

OSSA PARIETALIA or BREGMATIS, are two large bones which compoſe the ſuperior and lateral parts of the ſcull; on the inſide they are remarkably imprinted by the arteries of the Dura Mater. Tab.iii. 7. Tab. viii. 4.

OS FRONTIS, makes the upper and fore-part of the Cranium; its lower parts compoſe the upper parts of the orbits of the eyes. On its inſide are impreſſed the external figure of the two hemiſpheres of the brain. In thin ſculls this bone has uſually a large thin ſpine in the middle of the inſide, running from the Os Ethmoides towards the crown of the head; but in thick ſculls it is frequently wanting, and in very thick ones uſually a Sinus in its place; the uſe of this ſpine is to ſtrengthen thin ſculls. Immediately above the Os Ethmoides in this bone, is a ſmall blind hole, through which runs a vein into the beginning of the longitudinal Sinus of the Dura Mater; between the eye-brows in this bone, are two or three large Sinuſes, and ſometimes four or five, which lead into the noſe; and on the upper edge of each orbit, a ſmall perforation, or a notch, through Tab.iii. 6.

which nerves and an artery paſs ſecure to the forehead: It has alſo a ſmall hole in each orbit near the Os Planum, through which paſſes a branch of the fifth pair of nerves. The Sinuſes and ſpine in this bone make it very dangerous, if not impracticable, to apply a trephine on the middle and lower part of the forehead.

Os Ethmoides or Cribriforme, is a ſmall bone about two inches in circumference, ſeated in the arterior part of the baſis of the ſcull, being almoſt ſurrounded by the laſt deſcribed bone; it is full of holes like a ſieve, through which it is ſaid the olfactory nerves paſs, which I could never diſcover. In its middle ariſes a large proceſs named Criſta
Tab. viii. 23. Galli: And oppoſite to this a thin one which in part divides the noſe. The greater part of the Laminæ Spongioſæ in the noſe, belong to this bone.

Tab. iii. 14. Os Sphenoides, is of a very irregular figure; it is ſeated in the middle of the baſis of the ſcull, bounded by the Os Frontis, Ethmoides, Vomer Occipitis, Maxillæ Superioris, Oſſa Parietalia, Palati, Malarum, Temporum, and Petroſa, which are parts of the former
Tab. viii. 18. bones. In its inſide next the brain is a cavity, named Sella Turcica, which is bounded by four proceſſes called Clinoides; and oppoſite to the Sella Turcica is a proceſs which makes part of the Septum Narium. On the outſide of

of the ſcull adjoining to the upper jaw, are two proceſſes of this bone on each ſide, named Pterygoides, from which ariſe one on each ſide near the palate, having no name; over which are reflected the tendons of the Pterygoſtaphylini Externi muſcles; and nearer towards the Occiput, between theſe and the Styloid proceſſes of the Oſſa Petroſa, ariſe two more ſmall rugged proceſſes; and under the Sella Turcica in this bone, is a Sinus or two which open into the noſe, and in ſome ſculls only ſuch a ſpongy ſubſtance as is ſeen in the ends of ſome of the bones. At the inſide of the baſis of the two anterior clinoid proceſſes are two round holes, which are the firſt Foramina of the ſcull; through theſe the optick nerves paſs; almoſt under theſe, towards the ſides of the ſcull, are two irregular ſlits, named Foramina Lacera, or the ſecond Foramina of the ſcull, through which paſs nerves and blood-veſſels into the orbits of the eyes; and under theſe towards the Occiput are two round holes, which are the third Foramina, through which paſs nerves to the face; about half an inch nearer the Occiput, are two more of an oval figure, which are the fourth Foramina, through which paſs the largeſt branches of the fifth pair of nerves; and a ſtraw's breadth farther two very ſmall ones, called the fifth Foramina, through which thoſe branches of the Ca-

Tab. iv. B. 10.

Tab. iv. B. 11.

Tab. iv. 12. rotid arteries enter that are beſtowed upon the Dura Mater. Between this laſt deſcribed bone and the Oſſa Petroſa, are two large
Tab. iv. 13. rough holes, in which I have ſeen large veins; and from theſe holes through part of the Os Sphenoides, under the Pterygoid proceſſes are ſmall holes, through which paſs nerves and arteries to the back part of the noſe.

Tab. iii. 9. OSSA TEMPORUM, are ſituated below the parietal bones, at the middle and lower parts of the ſides of the ſcull; they have each at their back-parts, one large proceſs, called
Tab. iii. 10. Mammillaris, or Maſtoideus, and from the lower and middle parts of each a proceſs which joins the Oſſa Malarum, named Jugalis or
Tab. iii. 13. Zygomaticus.

OSSA PETROSA, lie between the former bones and the occipital bones, or are truly portions of the former bones, being never found ſeparate in adult bodies. They have each on their outſide one long ſlender proceſs, cal-
Tab. iii. 12. led Styliformis, and from the ſide of this proceſs a Foramen, which runs obliquely forwards into the ſcull; theſe are the ſixth Foramina;
Tab. iv. B. 5. and one Foramen in the inſide of the ſcull leading to the organs of hearing, which are the
Tab. viii. 15. ſeventh Foramina. The ridge on the upper parts of each of theſe bones in the inſide of the ſcull, as alſo on each ſide raiſed by the Os Frontis and Sphenoides, help to keep the brain

I ſteady,

ſteady, (See chapter Of the Dura Mater) and are admirable ſupports to the thin and flat parts of the ſcull, which elſe would be exceeding weak. (For what remains of this bone, ſee chap. Of the organs of hearing.)

Between the laſt deſcribed bones, and the following bone, are two large holes, which are the eighth Foramina. Through theſe holes Tab. iv. 14. paſs the Par Vagum and Lateral Sinuſes; ſometimes there are two on each ſide, one for the nerve and one for the Sinus. To theſe we may add another very ſmall one on each ſide, through which paſs the Portiones Duræ of the auditory nerves; and ſometimes there is another for an artery.

Os Occipitis, makes all the back-part Tab. iv. 2. of the ſcull; it is bounded by the ſphenoidal, temporal, petroſal, and parietal bones; it has two ſmall Apophyſes, by which it is articulated Tab. viii. 9. to the ſpine; near thoſe Apophyſes are two ſmall Foramina, which are the ninth of the Tab. viii. 10. ſcull; through theſe paſs the ninth pair of nerves; and between theſe is the great, or tenth Foramen, through which the Medulla Tab. iv. B. 15. Oblongata deſcends into the ſpine, the cervical arteries enter, and the cervical veins and tenth pair of nerves paſs out. In the inſide of this bone is a crucial ſpine impreſſed by the longitudinal and lateral Sinuſes; and on the outſide oppoſite to the middle of this ſpine,

Tab. viii. 7. in ſome bodies, is an Apophyſis, and from that down to the great Foramen, a ſmall thin ſpine. The ſpines in this bone are of the ſame uſe with thoſe in the Os Frontis, &c. viz. to ſtrengthen it, which they do here in a greater degree than in any other bone of the ſcull. The thinner parts of this bone are alſo defended by the muſcles that cover them. This proviſion is very neceſſary, becauſe we can leaſt defend this part, and blows here are of worſe conſequence than on any other part of the ſcull, becauſe wounds in the Cerebellum, which is underneath, are mortal. There are in moſt ſculls, a Foramen behind each Apophyſis of the occipital bone to the eighth Foramen; through which paſs Sinuſes, from the lateral Sinuſes, to the external cervical veins: By means of theſe communications, as in all other communications of the Sinuſes, the blood paſſes from thoſe that happen to be ſurcharged by any poſture of the head, into thoſe that from the ſame poſture would elſe have been almoſt empty. Such ſculls as want theſe Foramina, have two Sinuſes for the ſame purpoſe within the ſcull.

THE remaining bones of the head compoſe the face, orbits of the eyes and the jaws.

Tab. iii. 16. OSSA NASI, are ſmall oblong bones which make the upper part of the noſe; they make that kind of arch which is fitteſt to ſuſtain ſuch injuries as the noſe is moſt expoſed to.

OSSA

Ossa Malarum, these bones compose the cheeks, and the anterior, lower and outer parts of the orbits of the eyes; they have each a short process, which processes join the Processus Jugales of the temporal bones, and form arches which by some Authors, have been called Ossa Jugalia. Tab. iii. 15.

Ossa Ungues, are small bones about as large as thumb nails, seated immediately below the Os Frontis towards the nose in the orbits of the eyes, whose anterior and inner parts they help to compose; and between each of them and the upper jaw is a Foramen as large as a goose quill, into which the Puncta Lacrymalia lead, to carry off any superfluous moisture from the eyes into the nose. Tab. iii. 17. Tab. iii. 19.

Ossa Plana, are thin smooth bones seated immediately beyond the foregoing bones, in the orbits of the eyes, and are near thrice as big. They are indeed, but smooth surfaces of the Os Spongiosum, and not distinct bones. Tab. iii. 18.

Maxilla Superior, is always described single, though it is manifestly divided by a suture which is scarce ever wholly obliterated. It runs up with two processes to the Os Frontis between the Ossa Nasi and Ungues, and another, which joins to the cartilage of the Septum Nasi. Its upper and outward parts make the lower parts of the orbits of the eyes; its lower side, all that part of the Tab. iii. 20.

face under the cheeks, eyes, and noſe to the mouth, and two thirds of the roof of the mouth. A little below the orbits of the eyes, in this bone, are two holes, and behind the Dentes Inciſores one more, which divides into two, as it opens into the Noſe, one on each ſide the Septum Naſi. Between the poſterior grinding-teeth and the orbits of the eyes are two great Sinuſes, called Antra Maxillæ Superioris: And in the lower edge of this jaw are the Alveoli, or ſockets for the teeth. Part of the ſides of theſe cavities, that lie next the noſe, are only membranes which make the cavities like drums, perhaps to give a grave ſound to the voice when we let part of it through the noſe; but brutes not needing ſuch variety of ſounds, have theſe cavities filled with Lamellæ, which are covered with membranes in which the olfactory nerves terminate, for a more exquiſite ſenſe of ſmelling, than is neceſſary for men.

Tab. iii. 21.

I have ſeen an impoſthumation from rotten teeth in one of theſe cavities, which has been cured by drawing ſome of the laſt grinding-teeth, and by making a perforation into it through their ſockets. Mr. Cowper has admirably deſcribed this caſe. The ſigns of it are rotten teeth ſtinking breath, and great pain about the part. The drawing one or two of the laſt grinding-teeth, generally, if not always,

ways, in this caſe, opens a paſſage into the Antrum; but if not, or if the paſſage is not large enough, it may be made or enlarged with a carpenter's nail-piercer or gimblet, which is as good an inſtrument as can be for the purpoſe.

Ossa Palati, are two ſmall bones that make the back part of the roof of the mouth, and a ſmall part of the bottom of each orbit, unleſs theſe portions may be accounted diſtinct bones. Between the Oſſa Palati and Os Maxillare near the pterygoid proceſſes of the ſphenoidal bone, are two ſmall Foramina, through which arteries and nerves paſs to the palate.

Os Vomer, is ſeated between the bones of the palate, and the ſphenoidal bone. It is alſo joined to the proceſs of the Ethmoides, and part of the lower jaw. Its fore-part is ſpongy, and is continued to the middle cartilage of the noſe. This bone and cartilage are the Septum Naſi. Tab. viii. 24.

Os Spongiosum, is uſually treated as a diſtinct bone, though it is only the ſpongy Laminæ in the noſe, of the Os Ethmoides and Oſſa Plana, but chiefly of the Os Ethmoides, to which it always adheres. In conſidering theſe Lamellæ as a diſtinct bone, we follow the ancients, who did not diſtinguiſh the bones of the ſcull only, as they are divided by Sutures, but according to the differences of their

their texture, figure, ſituation, or uſe. Thus they called theſe parts, Os Spongioſum; a proceſs of the temporal bone, joined to the Os Malæ, Os Jugale; the temporal bone, which is one with the Petroſum in adults, Os Temporis, becauſe it is ſeated under the temples; and the other part, Os Petroſum, from its hardneſs or ruggedneſs; and the upper jaw one bone, though it is always two.

Tab. iii. 22. MAXILLA INFERIOR, is articulated with looſe intervening cartilages to the temporal bones, by two proceſſes, named Condyloides. Tab. iii. 24. Near theſe ariſe two more, very acute, called Coronales, and at the inſide of the chin a ſmall Tab. iii. 23. rough Proceſſus Innominatus. In the inſide of this bone under each Proceſſus Coronalis, is a large Foramen which runs under the teeth through this bone, and paſſes out at the chin. Tab. iii. 25. In this Foramen or chanel, the veſſels paſs that belong to the teeth; and in the upper edge of this jaw are the Alveoli, or ſockets for the teeth.

Tab. iii. DENTES, the teeth ſeldom exceed ſixteen in each jaw; the four firſt in each are called Inciſores, the two next Canini, and all the reſt Molares; the four laſt of theſe are named Dentes Sapientiæ, becauſe they do not appear till men arrive at years of diſcretion. The Inciſores and Canini have only one ſingle root, but the Molares more; the eight firſt, two; and

and the reſt, ſome three, ſome four; eſpecially in the upper jaw, becauſe the upper jaw being more ſpongy than the other, the teeth need more fangs to fix them. Each of theſe fangs, or roots, has a Foramen, through which paſs an artery, vein, and nerve; which are expanded in a fine membrane lining a cavity in each root of a tooth. This membrane is the ſeat of the tooth-ach.

The teeth of children caſt off while they are growing; but the ſucceeding teeth ariſe in new ſockets, and larger than the former; for the jaws increaſing faſter than the teeth, muſt otherwiſe of neceſſity have left chaſms between them, ſuch as there are in the mouths of brutes; but where teeth are drawn in adult bodies, the ſockets cloſe and new teeth very rarely ariſe.

CHAP. III.

Of the Bones of the Trunk.

THE bones of the trunk are thoſe which compoſe the ſpine or chain of bones from the head down to the rump, the ribs and Sternum.

The ſpine, is compoſed of twenty four Vertebræ, (each of which in a young child is three **Tab. i. ii.**

three bones) befides thofe of the Os Sacrum and Coccygis; feven belong to the neck, the
Tab.iv.G. firft of which is called Atlas, the fecond Dentata, from a procefs in that bone bearing the fame name; twelve to the back, five to the
Tab. iv. H. 1. Loins. The Os Sacrum is fometimes five, fometimes fix bones, and the Os Coccygis four. If this chain had been compofed of fewer bones, they muft have either not been capable of bending fo much as they do, or have bent at lefs obtufe angles, which would have prefs'd the fpinal marrow.

Tab. iv. H. I. K. In all thefe Vertebræ, except the firft, is a middle anterior fpongy body, by which they
1. are firmly articulated with a very ftrong intervening ligament; and from the middle of the hind part of each, except the firft, ftands a
4. procefs named Spinalis, and from every one a
2. procefs on each fide, called Tranfverfalis, and two fuperior, and two inferior fhort ones; by which the back parts of the Vertebræ are ar-
3. ticulated, named Obliqui, Superiores, and Inferiores.

The fore part of the feven Vertebræ of the neck, and two upper of the back, are flat forwards, to make room for the Afpera Arteria and Gula: The third and fourth of the back very acute, to give way to the divifion of the veffels of the lungs and heart, and bent to the right fide for the fituation of the heart, which

which makes that ſide of the breaſt ſomewhat more convex than the other, and therefore I think ſtronger; which is an advantage to the right arm, becauſe its motions depend upon the ſupport it receives from the breaſt.

Hence, I think, it ſeems that the almoſt univerſal preference of that arm is not an arbitrary thing, but founded upon obſervation, that it is capable of more perfect actions than the other.

The ſpinal proceſſes of the ſecond, third, fourth and fifth Vertebræ of the neck are forked, the two laſt of the neck long and horizontal, the three or four upper ones of the back like them, only a little declining, the middle ones of the back run obliquely downwards, and the proceſſes of the remaining Vertebræ become ſucceſſively thicker, ſtronger, and leſs declining; thoſe of the Loins being horizontal, like the laſt of the neck. The muſcles that are inſerted into the ſpinal proceſſes of the Vertebræ of the neck and loins, will act with more ſtrength than thoſe of the back, becauſe their proceſſes being perpendicular to the ſpine, they are longer leavers; beſides, thoſe of the back touch one another, and prevent much motion, becauſe it would interrupt reſpiration; and much motion being neceſſary in the neck and loins, their proceſſes are made fit for it.

The

The transverse processes of the Vertebræ of the neck are perforated, for the admission of the cervical blood-vessels, and bowed downwards, and hollowed, for the passage of the cervical nerves. The eight or nine upper ones of the back, receive the upper ribs; and the rest, with those of the loins, serve only for origins and insertions of muscles. The shape of the spine is like an Italick *ſ* bending inwards at the loins, and outwards at the shoulders; therefore when women that are either very young or very weakly, breed, the child by a continual pressure against the loins, makes them streighter, which necessarily makes the shoulders or back so much more convex, and the pressure upon the abdominal muscles at the same time bringing the ribs downwards, they grow round-shouldered and flat-breasted.

Tab. ii. 13. Os Sacrum has two upper oblique processes, some small spinal processes, and two Foramina in each interstice of the bones it is composed of, both before and behind.

Os Coccygis has none of these parts.

Tab. ii. 14. Through every bone of the spine, the Os Coccygis excepted, is a large Foramen, which together make a chanel through the spine, in which is contained the Medulla Spinalis; and in each space between the Vertebræ are two large holes for the nerves to pass out.

'Tis worth confidering, the provifion that is made to prevent luxations in this chain of bones, fuch luxations being worfe than any other becaufe of the fpinal marrow which is contain'd within thefe bones. The bodies of the Vertebræ are all in the fame manner connected by ftrong intervening ligaments or cartilages. In the neck the oblique proceffes of the received bone are wrapped over thofe of the receiving bone, which forbids their luxating forwards. The tranfverfe proceffes with a fmall Apophyfis of the body of the fame bone, in like manner, fecures them from flipping backwards, and an Apophyfis on each fide of the body of the receiving bone, hinders them from flipping to either fide. The Vertebræ of the back are hindered from diflocating forwards by the fame provifion with thofe of the neck; and from luxating backwards, by the ribs which are faftened to the tranfverfe proceffes of the inferior Vertebræ, and againft the back-part of the body of the next fuperior; they alfo hinder them from diflocating to either fide; but the ribs at the two or three laft Vertebræ of the back are not fixed to the tranfverfe proceffes, and therefore it is that luxations are moft frequently feen in this part; but the Vertebræ of the loins are received into deep cavities, and are tyed with much ftronger ligaments for their fecurity.

ſecurity. Each joint of the Vertebræ, except the two uppermoſt, has two centers of motion, one upon the bodies of the Vertebræ, when the body is bowed forwards; and the other at the articulations of the oblique proceſſes, when the body is bowed backwards; from which ſtructure the extenſors will have about twice the leaver to act with, and conſequently twice the power to raiſe the trunk into an erect poſture, that they have to carry it beyond that poſture; for then the oblique proceſſes begin to be the centre of motion, and give the ſame advantage to moſt of the benders. Without this contrivance it would have been more difficult, if poſſible, to have kept the body erect for any length of time, or to have recovered an erect poſture with conſiderable ſtrength after a bend of the body.

Tab. i. ii. THE ribs are twelve in number on each ſide; the ſeven uppermoſt are called true ribs, becauſe their cartilages reach the Sternum; and the five loweſt are called baſtard-ribs. They are articulated to the bodies of the twelve Vertebræ of the back, and all except the two or three laſt are articulated to their tranſverſe proceſſes, and the under ſide of the middle ribs are hollowed for the paſſage of the intercoſtal veſſels. They defend the parts contained in the breaſt, and when they are drawn upwards, the cavity of the breaſt is enlarged for

for inſpiration, and ſo the contrary. In two children which I have diſſected, I found the ribs broke inwards, and on the outſide a plain print of a thumb and four fingers, which had been made by their nurſes hoiſting them up on one hand, taking hold of their breaſts, which being very often repeated, had broke the ribs inwards like a green ſtick, without ſeparating the broken ends of them; and I have very frequently ſeen the ſhape of childrens breaſts quite ſpoiled by ſuch tricks, which has occaſioned weakneſs of body, crookedneſs, and other Diſeaſes.

STERNUM, or breaſt-bone, is generally made up of three ſpongy bones, ſometimes more, to this the true ribs are articulated by their cartilages. See chapter of the cartilages. Tab. i. 2.

OS HYOIDES (I chuſe to mention it in this place, becauſe I know none more proper among the bones) is a ſmall bone at the root of the tongue; it ſerves only for muſcles to ariſe from, and be inſerted into. It is made of three bones, the middle one is called Baſis, the other Cornua. Tab.iv.C. 1. 2.

I HAVE ſeldom found fewer than four and twenty Vertebræ in the ſpine, beſides the Os Sacrum, but often more; ſometimes thirteen of the back, with as many ribs of a ſide; and ſometimes ſix in the loyns: And in ſome bodies two ribs from the firſt Vertebra of the loyns; but then it has wanted tranſverſe proceſſes.

D A WOMAN

A WOMAN in the hoſpital with the venereal diſeaſe, having ſeveral bones carious, among the reſt two of the Vertebræ of the Neck had their ſpongy bodies corroded, which ſeparating from their other parts while ſhe was in a ſalivation, her head could no longer be ſuſtained, but bowing forward, the ſpinal marrow was compreſſed and ſhe died ſoon after.

CHAP. IV.

Of the Bones of the upper Limbs.

Tab. i. 3. ii. 3. CLAVICULA, is of the figure of the italick *ſ*, one end is articulated to the Sternum, and the other to the Proceſſus Acromion of the Scapula; it ſerves to fix the Scapula, and to determine its motions. This bone is oſſified as early as any bone in the body, and is the ſooneſt united when broken.

Tab. ii. 4. SCAPULA, its parts are the Acetabulum, which is a ſhallow cavity to receive the Os Humeri: A large ſpine from whoſe fore-part Tab. ii. 5. ſtands a proceſs called Acromion, and another proceſs from the fore-part of the upper edge of the Scapula named Coracoides; its upper edge is named Coſta Superior, and its lower one Coſta Inferior, and the poſterior edge its Baſis. I have ſeen a Scapula of a man which Dr. Douglaſs diſſected, in which the inſide of

the Acetabulum Scapulæ was broke all to pieces, and the Os Humeri diſplaced; which fracture, I believe, could not by any means be certainly known while the man was living, or if it could have been known, could not have been cured; yet I doubt not but the ſurgeon, whoever he was, did not eſcape cenſure for not making a cure.

WHENEVER the Proceſſus Acromion is broke, the arm can never after be raiſed to advantage; for no care of the moſt ſkilful ſurgeon can reduce ſuch a fracture; for the Deltoid muſcle will draw the ends of the broken proceſs aſunder, and will want a middle fixed place to act from.

OS HUMERI, this bone has at its upper end a round head for its articulation, and near that an Apophyſis, which is divided by a Sulcus, in which runs a tendon of the Biceps Flexor Cubiti. At its lower end are two Apophyſes, named the outer and inner. Between theſe Apophyſes on the fore-part of the bone, is a ſmall Sinus, which receives a protuberance of the Ulna, and behind a large and deep one, which receives the Olecranon of the Ulna. This bone being more liable to be broke by a blow than any other way, and it being uncertain where that ſhall fall, it is made of almoſt equal ſtrength through the whole length of it; and its lower end having a very ſmall joint, for Tab. i. 5. ii. 6.

D. 2 the

the ſake of a quick motion, the Sinuſes are formed there, to receive the proceſſes of the Ulna, to prevent diſlocations.

Tab. i. 7. ii. 8. Tab. ii. 9. ULNA, at its articulation to the former bone has two proceſſes, one large and thick, named Olecranon, and one ſmall one, named Proceſſus Anterior, and at the lower end of this bone is a ſmall proceſs, named Styloides.

WHEN about two inches or leſs of this bone is broke off at the lower end, it is ſcarce poſſible to raiſe it into its natural ſituation till the arm be turned prone; becauſe in a ſupine poſture the tendon of the Tenſor Ulnaris rides over it, and preſſes it down.

Tab. i. 6. ii. 7. RADIUS is received at the upper end by the Os Humeri and Ulna; at its lower end it receives the Ulna and Carpus. By its turning upon the Ulna, are performed the prone and ſupine motions of the cubit. About an inch below its upper end is an extuberance for the inſertion of the Biceps muſcle.

Tab. iv. M. 1, 2, 3, 4, 5, 6, 7, 8. CARPUS the wriſt, is compoſed of eight bones of irregular figure; they are diſtinguiſhed into four of the firſt order, and four of the ſecond. The two firſt of the firſt order are articulated with the Radius, the firſt of the ſecond order is articulated to the thumb, and the remaining three to the metacarpal bones. The inſide of theſe bones leave a ſemilunar cavity for the tendons of the muſcles which bend

bend the thumb and fingers to paſs through. What other reaſons there may be for this particular compoſition of bones, I know not; but this is plain, that by being moveable, one among another, they gradually give way, and leſſen the ſhock which any force againſt the hand would give, as the box of ſprings does the jolting of a coach, and thereby make the force leſs in each moment of time upon every bone of the arm, which greatly preſerves them from breaking; and the Scapula being fixed by muſcles, contributes very much to this purpoſe. This is an advantage that cannot be exactly computed; but it is certainly very great.

METACARPUS, is compoſed of four bones. Tab. iv. M. 9.

POLLEX, the thumb is made of three bones. Tab. iv. M. 10.

DIGITI, the fingers are each compoſed of three bones. For the figure of theſe, ſee the Table, which will give a better idea of them than a verbal deſcription. Tab. iv. M. 11.

CHAP. V.

Of the Bones of the lower Limbs.

OS INNOMINATUM, is, before puberty, compoſed of three bones; the uppermoſt is named Ilium, the lower and anterior Os Pubis, the lower and poſterior Os Iſchii. Tab. i. 11. ii. 12.

 The

The upper edge of the Ilium is called its ſpine, the anterior part of the ſpine its Apex, and lower than this is the Proceſſus Innominatus. The Iſchium has two proceſſes, the one called Acutus, the other Obtuſus. In the center of theſe bones is the Acetabulum, or ſocket, to receive the thigh-bone; in the bottom of which ſocket is another cavity, in which lies the lubricating gland of this joynt; and be-
Tab.i. 19. tween the Os Iſchium, and Os Pubis, is a large Foramen.

Tab.i. 12. Os Femoris, at its upper end has a round head which is received into the Acetabulum of the Os Innominatum. A ſmall diſtance
Tab.i. 13. ii. 17. from this are two proceſſes, named Trochan-
Tab. ii. 17. ter Major, and Trochanter Minor. The ſpace between the greater proceſs and the head of this bone is called its neck, and from the leſſer Trochanter down the back-part of this bone till within four or five inches of the lower end, is a ridge, called Linea Aſpera. At the lower end of this bone are two Apophyſes, one exterior, and one interior. The chief uſe of the Linea Aſpera is, to ſtrengthen the thigh-bone; it is therefore ſo ordered, that it is always large, proportionably to the bend of the thigh-bone, and largeſt in that part of every thigh-bone that is moſt bent.

Tab. vi. G, H. In two bodies which I have diſſected, I have found this bone broke at its neck, and by that means

means the limb ſhortened, and the caſe miſtaken for a luxation of the hip; and if we conſider the depth of this articulation, and the wonderful ſtrength both of the muſcles and ligaments, we cannot but ſuſpect that this bone is much oftener ſo broke, than out. This is certain, that if by an external accident the thigh is made ſhorter, and yet is uſeful, that muſt needs be from a fracture, and not a diſlocation; for it cannot be, that the head of the thigh-bone ſhould form it ſelf a ſocket among the muſcles, to bear the whole weight of the body: Or ſuppoſing this could happen, though it is contrary to what we know in other like caſes, yet even then we muſt have new muſcles made, or theſe we have altered; for their directions with the thigh-bone being changed, their uſes would too, and almoſt all pull to the ſide contrary to which the bone is diſlocated.

It often happens, that from a flux of humours upon the hip, this joint appears diſlocated; for when it is attended with pain, the muſcles contracting alter the poſture of the limb, and make it appear ſhorter, as the limb which is lifted from the ground is when we ſtand on one leg: But if the fluxion is without pain, the muſcles relax, and the limb falls into the ſame figure, which that limb is in, which we ſtand on in that poſture, and appears

longer; which makes the common way of comparing of the limbs a very uncertain, if not impoſſible way to diſcover the caſe; therefore to know certainly, apply a ſtraight rule from the Apex of the ſpine of one hip to that of the other, then from the middle of that rule draw a perpendicular line between the legs; then meaſure the limbs at that line in the ſame plane, and if their lengths are equal, they are moſt certainly right.

Tab. i. 14. PATELLA, the knee-pan is ſeated upon the joint of the knee; its uſe is for the extenſors of the Tibia to be inſerted into, leſt paſſing over that joynt, they might be too much expoſed to external injuries; it alſo gives an advantage to the muſcles, by removing their Axis farther from the center of motion of the knee.

Tab i. 18. ii. 18. TIBIA, the ſhin-bone is in its middle almoſt triangular, which it ſeems to owe to the preſſure of the muſcles, for it is cylindrical in a Fœtus. In its upper end are two ſhallow ſockets, between which is a proceſs for the croſs ligament of the knee to ariſe from; a little below its head is another proceſs, to which the ligament of the Patella is fixed, and at its lower end another, which makes the inner ankle.

A BOY of ſeven years old was brought to me with both the Epiphyſes at the upper ends of the Tibiæ, ſo far ſeparated from the Tibiæ,

that

that not more than half each Tibia was joined to half the Epiphysis, which made the legs wholly useless. This had been occasioned by the nurse holding him out to stool by the heels and back, when very young, which is among them too common a practice. I dissected the leg of a man that had broke the Tibia through the flesh, by a fall from the top of a house; no extension that was made moved this compound fracture at all, which I afterwards found to be occasioned by a simple transverse fracture above, which always gave way to the extension; that bit of bone whose end came through the skin, being discontinued from the parts by which the extension was made. In the foot of the same leg, four of the bones of the Tarsus were cracked, two more of them, viz. the Os Calcis and Naviculare, had large pieces separated, which were broke into a mash; and all this without any dislocation among these bones, or any the least external wound or bruise.

FIBULA, is a long small bone, its upper end is articulated to the outside of the Tibia, an inch below its joynt, and the lower end makes the outer ankle, and part of that joynt; its chief use is for origins of muscles; for it has no share in supporting the body. A strain of the worst kind happens often to this joynt from the mighty force of the Peronei muscles, when Tab. i. 16. ii. 19.

when we endeavour to prevent a fall; for they being turned over the end of the Fibula, as on a pulley, part of their force lies againſt this bone, and ſtreins the ligaments that hold it, and ſometimes the bone it ſelf is broke by them; which wants no care to ſet, and can ſeldom be diſcovered till the ſwelling is fallen.

Tab.iv.L. 1, 2, 3, 4, 5, 6, 7. TARSUS, is made up of ſeven bones, which are called Aſtragalus, Os Calcis, Naviculare, Cuboides, Cuneiforme, Majus, Medium, and Minimum. The bones of the Tarſus have the ſame kind of elaſtick ſtructure with thoſe of the Carpus, and for the ſame ends, but in a much greater degree; becauſe here the whole body is ſuſtained. This ſort of contrivance, and the uſe of it, are both very evident in the laſt joynts or paſterns of the legs of horſes; for horſes that have long paſterns, and much elaſtick motion in them, muſt neceſſarily trot high, and yet they always trot eaſie; but a horſe with ſhort paſterns, that trots high, always trots hard.

AN old man that had the under part of the Os Calcis laid bare as large as a half-crown, by a mortification, being brought to the hoſpital about two years after the bone was firſt bare, and all endeavours to ſcale it having proved ineffectual, I pared it with a chiſel till the bone bled, and it covered with granules of fleſh,

in

in about three days, and afterwards healed very eaſily.

METATARSUS, is compoſed of four bones. Tab. iv. L. 8.

POLLEX PEDIS, is compoſed of three bones. Tab. iv. L. 9.

DIGITI PEDIS, each is compoſed of three bones, but the two laſt of the little toe often grow into one. Tab. iv. L. 10.

FOR the figure and ſituation of theſe bones, ſee the table.

OSSA SESAMOIDEA, are ſaid to be found to the number of forty-eight: But we commonly find no more in the feet than two under the ball of each great toe; Tab.iv.D. and in the hands ſometimes two very ſmall ones at the middle joynt of each thumb; Tab.iv.E. and ſometimes one at the lower end of each thigh-bone at the beginning of the Plantaris muſcle. Tab.iv.F. Their uſe is the ſame with the Patella

I find alſo in ſome bodies the little cartilages at the receiving ends of the bones of the fingers oſſified; which ſurely thoſe authors reckon among the Seſamoid bones, who ſay they are found to the number of forty-eight.

CHAP.

CHAP. VI.
Of the Cartilages.

EVERY part of a bone which is articulated to another bone for a ſliding motion, is covered or lined with a cartilage, as far as it moves upon, or is moved upon by another bone in any action; for cartilage being ſmoother and ſofter than bone, it renders the motions more eaſy than they would have been, and prevents the bones wearing each other in their actions. Theſe cartilages in the largeſt joynts, are as thick as a ſhilling, and in the ſmalleſt, as thin as paper.

In the forepart of each articulation of the lower jaw, there is a looſe cartilage upon which the condyloid proceſs moves on one ſide, while the jaw is moved to the other; and the two proceſſes being thus raiſed at once, the jaw is thruſt forward.

In the joint of the knee are two looſe, almoſt annular cartilages, which being thick at their outer edges, and thin at their inner ones, they make the greateſt parts of the two ſockets in this joynt. The uſe of theſe cartilages is to make variable ſockets to ſuit the different parts of the lower end of the Os Femoris, for none but a round head and a round cavity can ſuit in motion, unleſs the ſhape of one or the other

other alters; and it is plainly neceſſary, that this lower end of the Os Femoris, ſhould be flattiſh, and projected backward, to give advantage to the muſcles that extend the Tibia, by ſetting the center of motion backward; which mechaniſm, though it equally leſſens the power of thoſe muſcles which bend this joint, is yet of great ſervice, becauſe the extending muſcles move this joynt under the weight of the whole body, but the flexors only raiſe the legs; and as no head or ſocket moves ſo eaſily as round ones, here ſeems to be ſome proviſion made againſt the inconvenience of a flattiſh head and cavity, by having the friction made upon two ſurfaces, the Os Femoris upon the looſe cartilages, and the looſe cartilages upon the Tibia. This contrivance is always found neceſſary by mechanicks, where the friction of the joynts of any of their machines is great, as between the parts of hook-hinges of heavy gates, and between the male and female ſcrews of large vices, where they always place a looſe ring.

There are other cartilages which ſerve to give ſhape to parts. Of this ſort are the ciliary cartilages at the edges of the eye-lids, the cartilages of the outer ears, and thoſe which compoſe the lower part of the noſe, which have this particular advantage in theſe places, that they ſupport and ſhape the parts as well as bones do, and without being liable to be broke.

Tab.i. 20. THE ribs have cartilages of a confiderable length, which articulate the feven uppermoft, and fometimes eight on each fide to the Sternum; which cartilages being very pliable, fuffer the ribs to move eafily in refpiration, and the body to twift or bend to either fide without difficulty. But the cartilages of the lower ribs do not reach the Sternum. And at the bottom of the Os Pectoris or Sternum, is a cartilage which is named from its commoneft figure, Enfiformis.
Tab. i. 21.

THERE are other cartilages which compofe the Larynx and Afpera Arteria. The Larynx is formed of five: The foremoft is like a Saddle, but is named Thyroides; behind this are two called Arytænoides; they compofe the Rimula of the Larynx. Over thefe is the Epiglottis to cover the Rimula while the aliment paffes to the Pharynx; and under them one like a feal ring, named Cricoides. The cartilages which compofe the Afpera Arteria, or remaining part of the wind-pipe, are not quite annular, but connected by membranes at their back-part, to give way to the aliment defcending through the Pharynx.

THERE are other parts that authors call cartilages, which I rather chufe to rank with the ligaments: And therefore will defcribe them in that chapter, as thofe between the bodies of the Vertebræ, &c.

I HAVE ſeveral times found ſupernumerary cartilages from the Sternum, running between the ribs, and frequently the Cartilago Enſiformis double. I do not remember that I have ever ſeen a cartilage ſcale like a bone, or ſlough like ſofter parts, though I have often ſeen them eat through by matter that has been collected in a joynt, which has ſometimes occaſioned the bones to grow together. Tab.iv.E.

CHAP. VII.
Of the Ligaments.

EVERY bone that is articulated to another for motion, is ty'd to that it moves upon, by a ligament, whoſe thickneſs and ſtrength always bears a proportion to the quantity of motion in the joint, and the force with which it is liable to be moved; and the length of the ligament is no more than ſufficient to allow a proper quantity of motion.

THE bones of the limbs that move to all ſides, have ligaments like purſes, which ariſe from or near the edges of the ſockets of the receiving bones, and are inſerted all round the received bones, a little below their heads.

THE beginnings of theſe ligaments, from edges of the ſockets of the Scapula and Os Innominatum

nominatum are very hard, almoſt cartilaginous, which ſerves in the Scapula to make a larger ſocket, and ſuch a one as will alter its figure as the bone moves, for the reaſon I have mentioned in the looſe cartilages of the knee; for the head of the Os Humeri, not being an exact portion of a ſphere, requires ſuch a ſocket, and the hard part of this ligament of the ſocket of the Os Innominatum makes the ſocket deeper than the ſemidiameter of the ſocket, without any hindrance to motion, becauſe it will give way to the neck of the Os Femoris, when it preſſes againſt it.

The ligaments of thoſe articulations which admit only of flexion, and extenſion, differ from the former in this only; that they are much ſhorter and ſtronger at the ſides of the joynts, and thinner backward and forward.

At the upper part of the articulation of the Os Femoris and Os Innominatum, is a ſtrong ligament of great conſequence; it contributing very much to preſerve that joint from being luxated by the weight of the body. And from the lower edge of the Acetabulum of the Os Innominatum, runs a ligament to the middle of the head of the Os Femoris, about two inches long (which the motion in this joynt requires) called Teres, or Rotundum, whoſe uſe is to prevent the Os Femoris from being luxated upwards, but downwards it will let it go far

out

out of the ſocket; which fully ſhews, that in men it is particularly contrived to prevent the thigh-bone from being diſlocated upwards; but in brutes the head of the Os Femoris being oblong, and the cavity ſuitable, there can be only a rotatory motion which in the effect will be very little more than that kind of motion which is called bending and extending; and this never removing the end of the head of the bone far in the ſocket, a ſhort ligament is enough for it, and will better keep the bone in its place; and therefore it is that theirs is ſo ſhort. This ligament in men may alſo ſerve to preſs the gland in the bottom of the Acetabulum or ſocket.

Towards the great Foramen, of the Oſſa Innominata, the Acetabulum has a deep notch, from one ſide of which to the other, runs a ligament, which I have ſeen oſſifyed. Such a ligament there is alſo running from one proceſs of the Scapula to the other, which hinders the Os Humeri from diſlocating upward.

In the middle and back-part of the joint of the knee are two very ſtrong ligaments which ariſe from a proceſs at the end of the Tibia. They croſs each other in ſuch a manner, as is beſt to ſecure the joint from being diſplaced any way; they alſo hinder the extenſors of the Tibia from pulling that bone too far forwards.

All the bones of the Vertebræ, and every joint that is without motion, and not joined by a suture, as the Ossa Innominata with each other, and the Os Sacrum with the Ossa Innominata, are all joined by intervening ligaments, commonly called cartilages

The Processus Dentatus of the second Vertebra, is tied to the scull by a ligament, and kept close to the forepart of the first Vertebra by another in that Vertebra, that it may not bruise the spinal marrow; and when either this ligament or process is broke, it makes that sort of broken neck which is attended with sudden death.

The bones of the Carpus and Tarsus are tyed together by ligaments running promiscuously upon their surfaces from one to another; which at the under side of the Tarsus are vastly strong, because they support the whole body. There is also to the Carpus, a strong ligament which runs from the fifth bone to the eighth, and the process of the fourth bone: The proper use of this is, to bind down the tendons of the muscles that bend the fingers.

The Os Hyoides to the Processus Styliformis of the Os Petrosum, the Patella to the Tibia, and the sesamoid bones in their places, are all tyed by ligaments.

From the edge of the Illum to that of the Os Pubis, runs a ligament which is contiguous

to, and appears to be a part of, the tendons of the oblique muſcles of the Abdomen; its uſe is to cover the iliack veſſels as they deſcend to the thigh: Under this ligament, together with the veſſels, I have often met with a rupture of matter, and, I think, ſometimes the gut, (however I dare affirm that to be a poſſible caſe) from the Abdomen into the anterior part of the thigh, immediately below the groin. Such caſes are well worth the obſervation of ſurgeons; becauſe opening ſuch tumours may be of very bad conſequence.

THE tendons of all the muſcles that are not involved in fat, are either tyed down to the bones they paſs over, by ligaments which contain a lubricating Mucus, or have ſometimes communications with the joint they move: As has been curiouſly obſerved by Dr. Douglaſs, particularly in the joint of the hip. The uſe of theſe ligaments is to confine them to their proper directions, and contain the Mucus that lubricates their ſurfaces, to make their motions more eaſy.

FROM the Tibia to the Fibula, and from the Ulna to the Radius, are tranſverſe ligaments which help to keep theſe bones together, and give origins to a great many muſcles. There is another of this ſort in the great Foramen of the Oſſa Innominatum; and one between the Os Sacrum and proceſſes of the Oſſa Iſchia;

and ſome more in the body, too ſmall to have a particular account given of them in this place.

Authors agree, that the ligaments are inſenſible; and give for their reaſon, that they would elſe be injured by ordinary motions. But they are much better contrived, ſeeing none of them, except thoſe which lie between the bones, are ſubject to attrition; and thoſe they have called cartilages. I do not think that theſe laſt are ſenſible; but the other I have had frequent experience are capable of very acute pains, there being not any thing our patients more grievouſly complain of, than collections of matter within theſe parts, or ſharp medicines applied to them when laid bare.

CHAP. VIII.

Of the lubricating glands of the joints.

Every joint where the bones are faced with a cartilage for a ſliding motion, is furniſhed with ſmall glands, which ſeparate a mucilaginous matter for the lubricating of the ends of the bones, that they may move eaſily upon one another; and that there may be no

 waſte

waſte of this neceſſary fluid, it is contained in the inveſting ligaments; which for this very reaſon are no where divided, except to communicate with the ligaments of tendons.

THESE glands are generally ſeated near the inſertions of the ligaments, that they may be compreſſed by them when the joints are in motion; which is a proper time to have their fluid preſſed out.

THERE is one large gland of this ſort, ſeated in a Sinus at the bottom of the Acetabulum of the Os Innominatum, which is compreſſed by the Ligamentum Teres.

WHEN from violent bruiſes, or any other cauſe, theſe glands are ulcerated, they throw off a corroſive matter, which erodes the cartilages of the bones, 'till it inſinuates it ſelf into their ſpongy heads, and renders their whole ſubſtance carious. When this diſeaſe happens to the hip, in time it makes its way through the ligament, and then it gets under the Gluteus Maximus to the outſide of the thigh under the flat tendon of the Faſcialis muſcle, and ſometimes to the forepart of the thigh, where the great blood-veſſels run. In this caſe, which is very rare, I apprehend that the ſurrounding ligament is perforated before, as was mentioned in the laſt chapter. Theſe caſes are generally, if not always, incurable.

A Caſe of a fractur'd ſcull, in a Girl nine years of age. Vide Tab. IX.

THIS girl being brought into the hoſpital the twenty ſeventh of May, ſeven days after the ſcull was fractured, having had all that time very bad ſymptoms; I immediately open-ed the ſcalp and let out about two ounces of gru-mous blood, and laid the ſcull bare about four inches one way, and three the other; and tied the blood veſſels, that I might make the opera-tion without much difficulty, the next morning. The fracture extended acroſs the Os Bregmatis, from the ſagittal ſuture, to the temporal bone; that part next the Os Frontis was depreſſed equal to its thickneſs, and a great deal of extra-vaſated blood partly turned to matter, lay un-der the other part of the ſame bone. I made two perforations with the trephine, cloſe to the fracture, that I might raiſe it up ſteadily through both, and have more room for the extravaſated blood to diſcharge from under the ſcull; which had diſcharged before in great quantity through the fracture. But nevertheleſs ten days after the former operation, I was obliged to make another perforation, to diſcharge the matter more freely; for during a month, the matter ran through all her dreſſings down her face, twice every day, and was exceedingly fœtid; and

and for the ſpace of five months the matter decreaſed very little in quantity, but grew leſs and leſs offenſive, till September the thirteenth, when the leaſt of the bones was taken out; Tab.ix. C. and on September the twenty ninth, the large one; after which time the matter was good, Tab.ix D. and not too much in quantity. Both theſe bones are through both Tables, for the motion in the brain was ſeen; only ſome little parts of the leſſer bone remaining, a callous was formed from them, but where the great one came away there was none, only a common cicatrix; and beſides theſe, there were many little bits of bone came away in the dreſſings: She was ſoon after cured, and has remained well ever ſince.

TABLE I.

The fore view of a ſceleton:

1 Os Frontis.
2 Oſſa Pectoris.
3 Clavicula.
4 Scapula.
5 Os Humeri.
6 Radius.
7 Ulna.
8 Carpus.
9 Metacarpus.
10 Spina Dorſi.
11 Os Innominatum.
12 Os Femoris.
13 Trochanter Major.
14 Patella.
15 Tibia.
16 Fibula.
17 Tarſus.
18 Metatarſus.

TABLE

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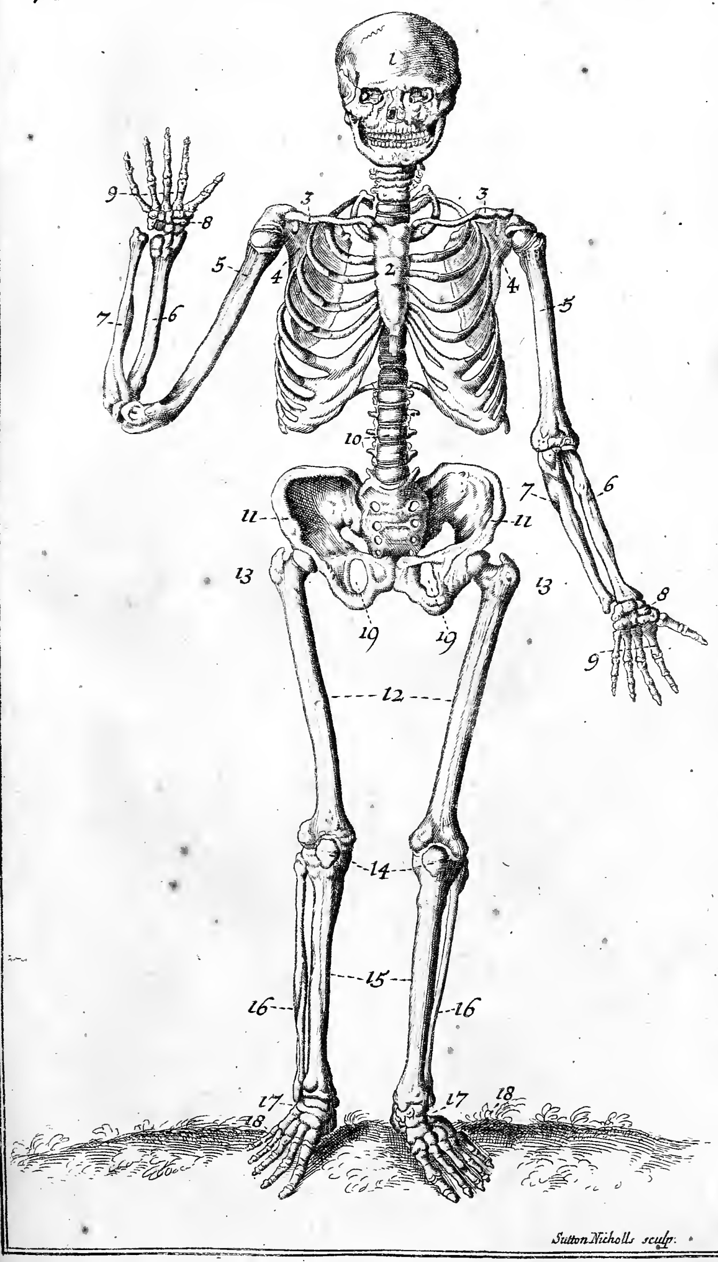
Tab. I.



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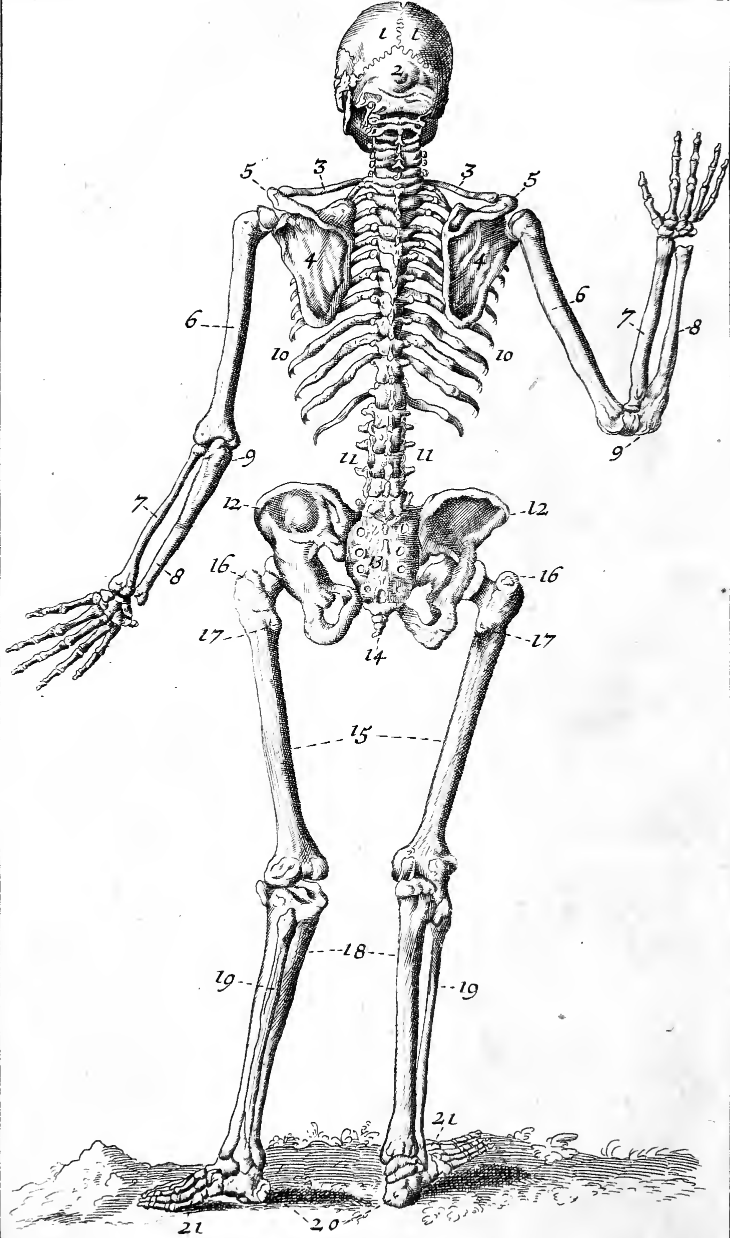
Sutton Nicholls sculp.

p. 57. TAB. II.



Sutton Nicholls sculp:

TABLE II.

The back view of a ſceleton.

1 Os Bregmatis.
2 Os Occipitis.
3 Clavicula.
4 Scapula.
5 Proceſſus Acromion.
6 Os Humeri.
7 Radius.
8 Ulna.
9 Olecranon.
10 Coſtæ.
11 Spina.
12 Os Innominatum.
13 Os Sacrum.
14 Os Coccygis.
15 Os Femoris.
16 Trochanter Major.
17 Trochanter Minor.
18 Tibia.
19 Fibula.

TABLE III.

The bones of the head.

1 Sutura Coronalis.
2 Sutura Sagittalis.
3 Sutura Lambdoidalis.
4 Sutura Squamoſa.
5 Sutura Tranſverſalis.
6 Os Frontis.
7 Os Bregmatis.
8 Os Occipitis.
9 Os Temporis.
10 Proceſſus Mammillaris.
11 Meatus Auditorius.
12 Proceſſus Styliformis.
13 Proceſſus Jugalis.
14 Os Sphenoides.
15 Os Malæ.
16 Os Naſi.
17 Os Unguis.
18 Os Planum.
19 Ductus ad Naſum.
20 Maxilla ſuperior.
21 Foramen Maxillæ ſuperioris.
22 Maxilla inferior.
23 Proceſſus Coronalis.

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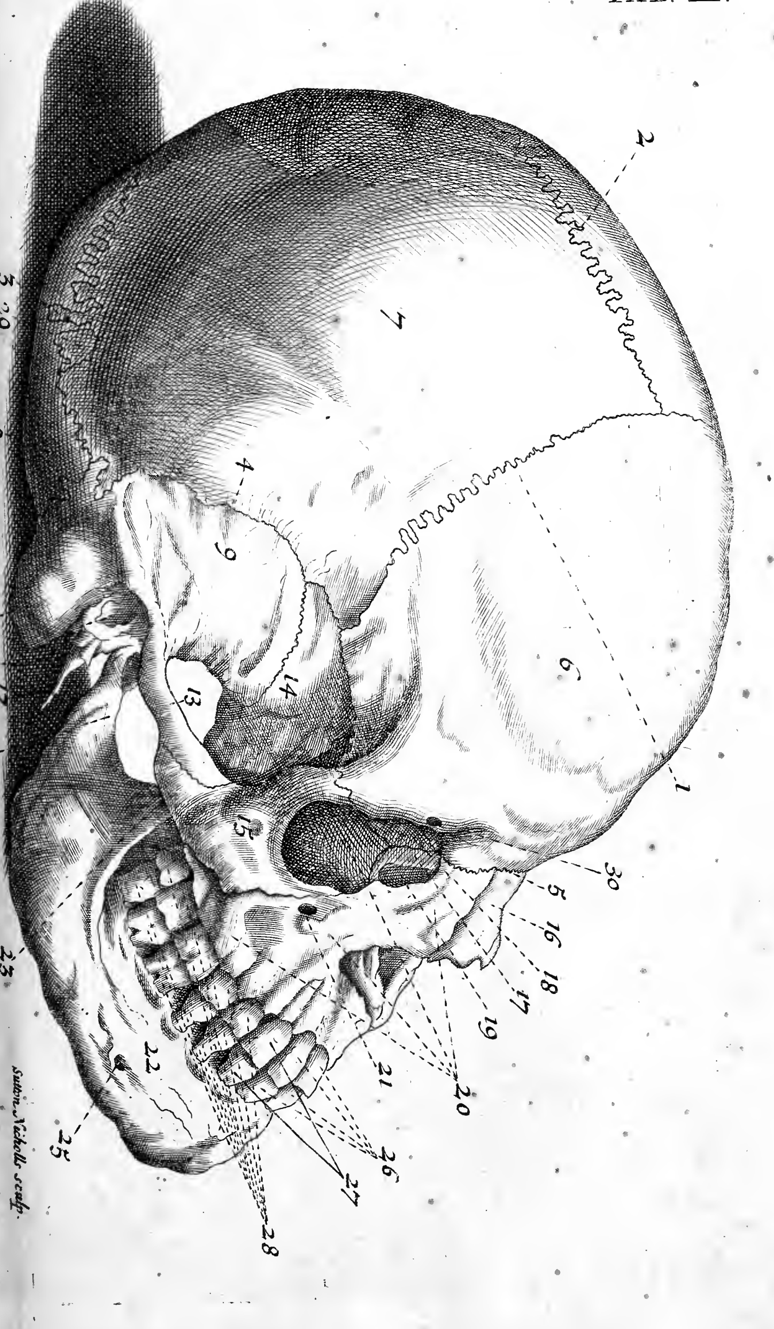
TAB. III.



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Sutton Nicholls sculp.

24 Proceſſus Condyloides.
25 Foramen *Maxillæ inferioris.*
26 Dentes Inciſorii.
27 Dentes Canini.
28 Dentes Molares.

TABLE IV.

A, *The fore view of the ſcull.*

1 Sutura Coronalis.
2 Sutura Sagittalis.
3 Sutura Squamoſa.
4 Satura Sphenoidalis.
5 Os Frontis.
6 Os Bregmatis.
7 Os Malæ.
8 Os Naſi.
9 Maxilla ſuperior.

B, A View of the Baſis of the ſcull.

1 Satura Lambdoidalis.
2 Os Occipitis.
3 Os Temporis.
4 Proceſſus Mammillaris.
5 Proceſſus Styloides.
6 Proceſſus Jugalis.
7 Os Malæ.
8 Os Palati.
9 Maxilla ſuperior.
10 Proceſſus Pterygoides.

C. The Os Hyoides,

1 Baſis.
2 Cornua.

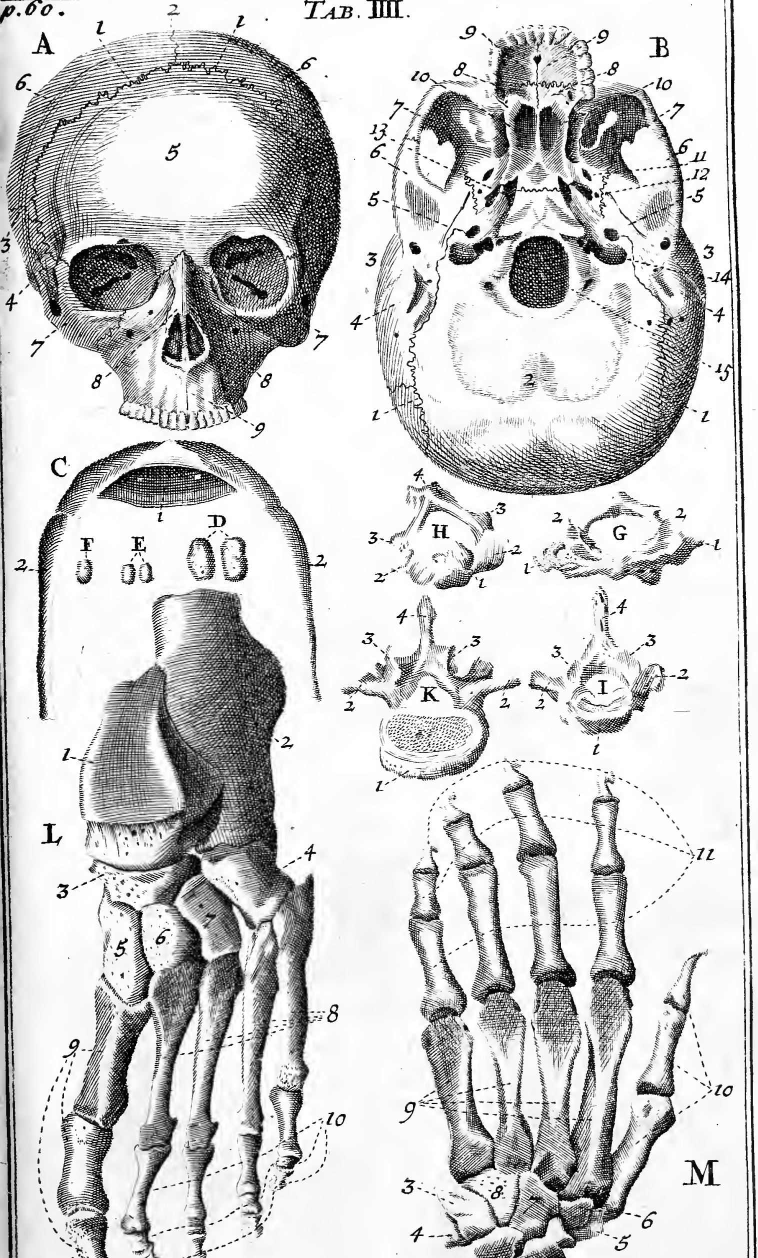
D, The Oſſa Seſamoidea of the great toe.

E, The Oſſa Seſamoidea of the thumb.

F, The

p. 60.

TAB. IIII.



F, The ſeſamoid bone that is ſometimes found near the beginning of the Plantaris muſcle.

G, The firſt Vertebra.
1 Proceſſus Tranſverſus.
2 Proceſſus Obliquus.

H, The ſecond Vertebra.
1 Proceſſus Dentatus.
2 Proceſſus Tranſverſus.
3 Proceſſus Obliquus.
4 Proceſſus Spinalis.

I, One of the Vertebræ of the Thorax.
1 Corpus Spongioſum.
2 Proceſſus Tranſverſus.
3 Proceſſus Obliquus.
4 Proceſſus Spinalis.

K, One of the Vertebræ of the loins.
1 Corpus Spongioſum.
2 Proceſſus Tranſverſus.
3 Proceſſus Obliquus.
4 Proceſſus Spinalis.

L, The bones of the Foot.
1 Aſtragalus.
2 Os Calcis.
3 Os Naviculare.
4 Os Cuboides.
5 Os Cuneiforme majus.
6 Os Cuneiforme medium.
7 Os Cuneiforme minimum.
8 Metatarſus.
9 Oſſa Pollicis Pedis.

10 Ossa Digitorum Pedis.

M, The bones of the hand.

1, 2, 3, 4, 5, 6, 7, 8. } The eight bones of the Carpus.

9 Metacarpus.

10 The bones of the thumb.

11 The bones of the fingers.

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TAB. V.

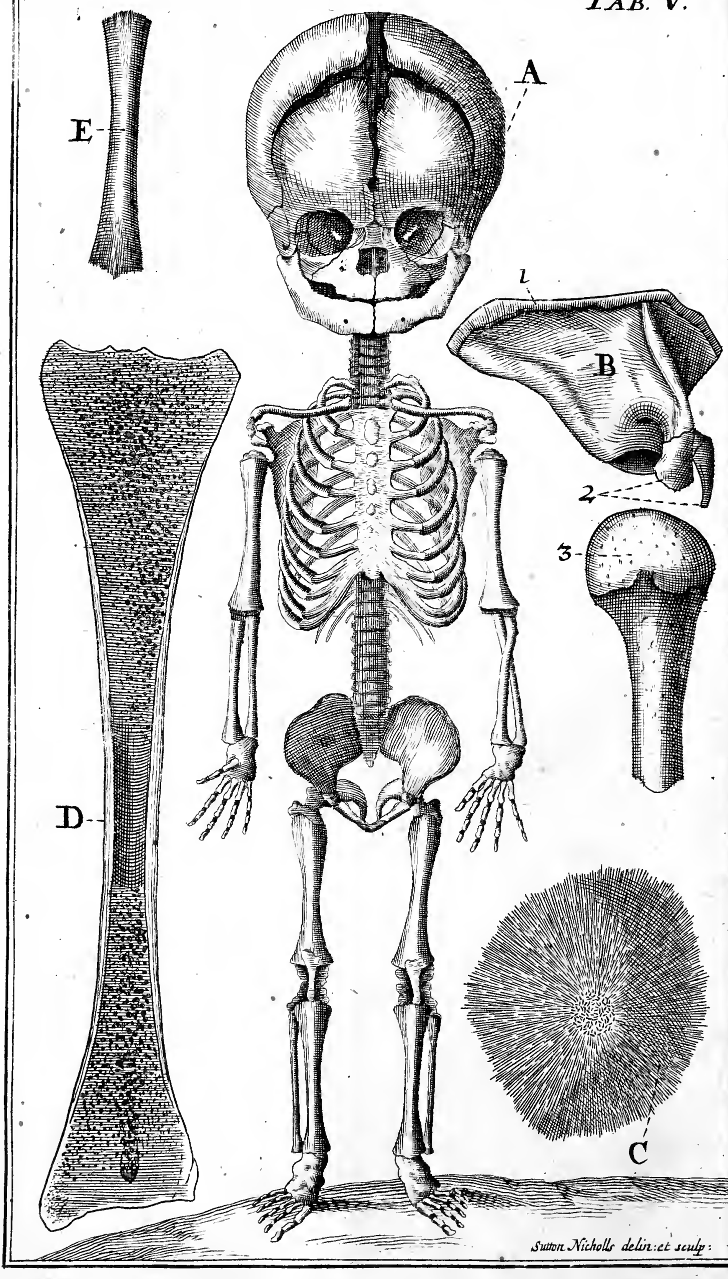


TABLE V.

A, SHEWS the Sceleton of a full grown Fœtus, in which may be obſerved, the Epiphyſes, the Carpus and Tarſus, which are cartilaginous ſhrunk in drying, and the ſhape in general differing from the Sceleton an adult.

B, The Scapula of a body twelve years old.

1 An Epiphyſis at the Baſis.

2 The Epiphyſes of its Proceſſes.

3 The Epiphyſis at the upper end of the Os Humeri from the ſame body.

C, The Bregma of a Fœtus five months old prepared, to ſhew the fibres oſſifying from a middle point, and ſhooting out on every ſide.

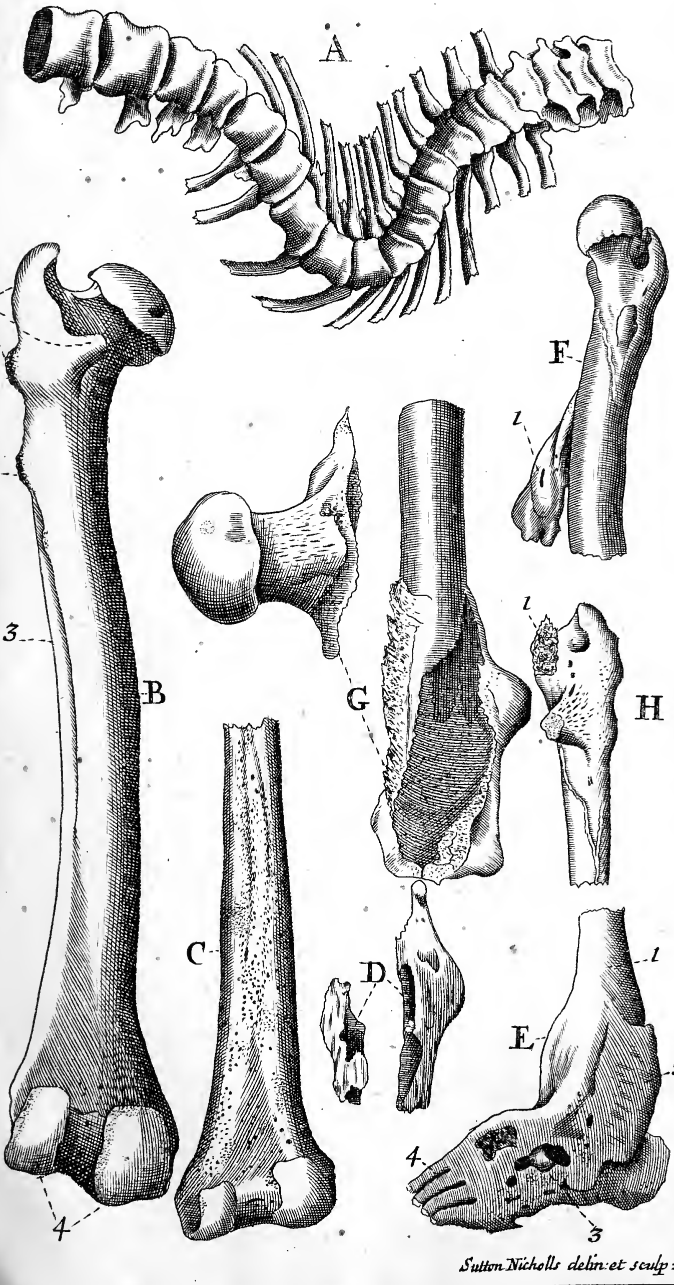
D, The Tibia ſawed length-ways.

E, The Tibia of a Fœtus five months old with the Epiphyſes off.

TABLE VI.

A, A Diſtorted ſpine.
B, The Os Femoris of a man eight foot high.
1 Shows three Trochanters.
2 A fourth Trochanter.
3 The Linea Aſpera.
4 The two inferior Apophyſes.
C, Part of an Os Femoris carious.
D, Half the lower jaw exfoliated.
E, Part of a carious leg and foot, with all the bones grown into one.
1 The Tibia.
2 The Fibula.
F, Part of a thigh-bone.
1 A bony excreſcence.
G, The head of the Os Femoris broke off, which had been miſtaken for a luxation.
H, Another piece of an Os Femoris with the head broke off; which was alſo miſtaken for a luxation.

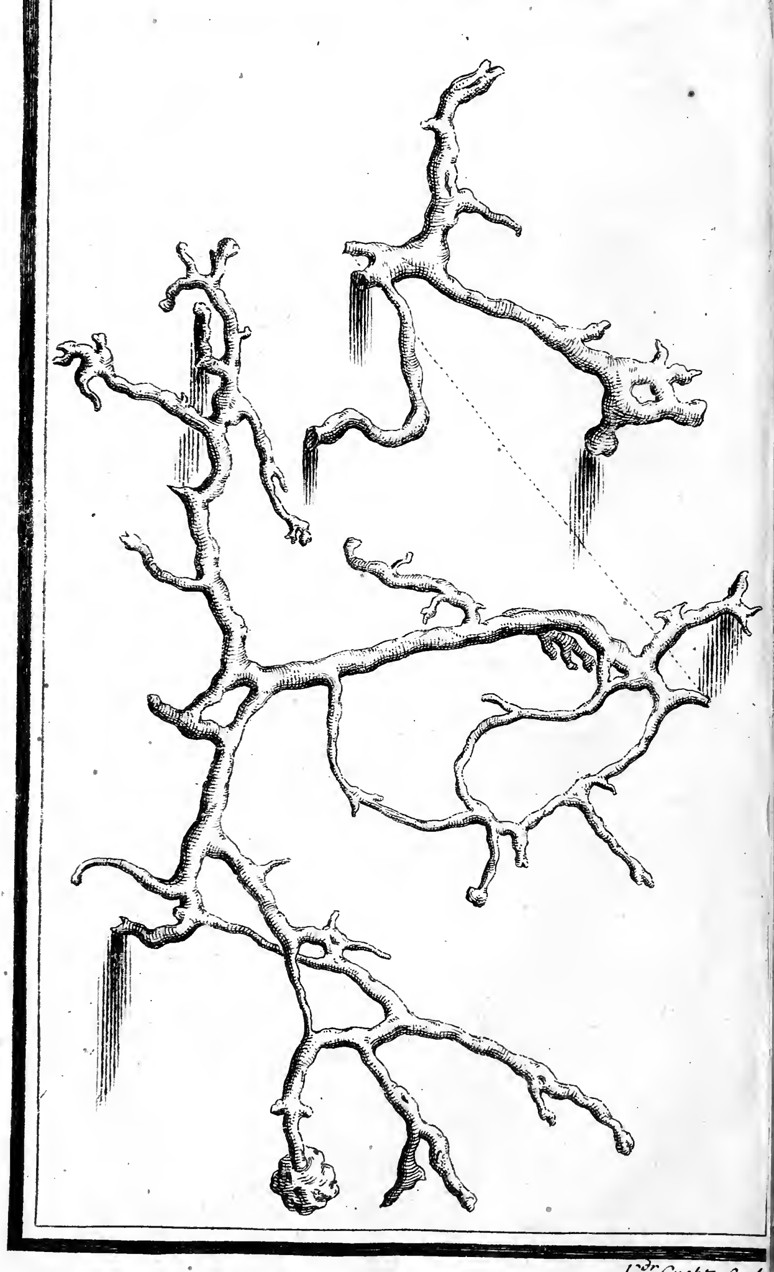
TAB. VI.



Sutton Nicholls delin: et sculp:

p. 65.

TAB. VII.



I. Vdr Gucht. Sculp.

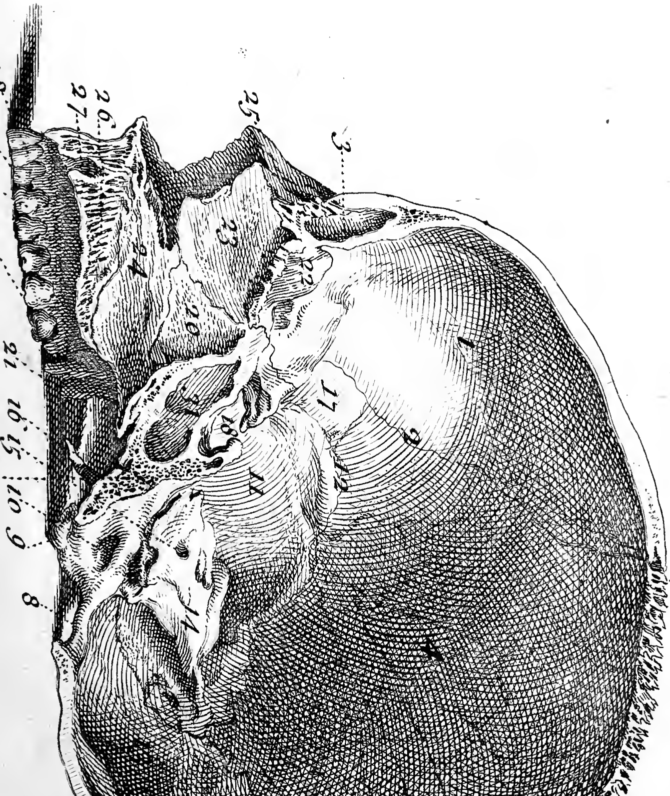
TABLE VII.

A Bone from the Omentum of a ſheep taken out and delineated by Dr. Steukley. The pricked line ſhews the places where the bones were united.

TABLE VIII.

Represents the inſide of the ſcull ſaw'd through longitudinally.

1 Os Frontis.
2 Sutura Coronalis.
3 Sinus Frontalis.
4 Os Bregmatis.
5 Sutura Sagittalis.
6 One of the Oſſa Triquetra.
7 A proceſs of the Os Occipitis.
8 Part of the Foramen Maximum.
9 The proceſs of the occipital bone that articulates it to the ſpine.
10 The ninth Foramen of the ſcull.
11 Os Temporis.
12 Sutura Squamoſa.
13 Os Occipitis.
14 Os Petroſum.
15 A Foramen, through which paſſes the auditory nerve.
16 Proceſſus Styliformis.
17 Os Sphenoides.
18 Sella Turcica.
19 The Suture between the Os Occipitale and Sphenoidale.
20 A proceſs of the Os Sphenoidale that makes part of the Septum Naſi.
21 Proceſſus Pterygoides.



22 Criſta Galli of the Os Ethmoides.
23 A proceſs of the Os Ethmoides making part of the Septum Naſi.
24 Os Vomer.
25 Os Naſi.
26 The Suture that divides the Maxilla Superior.
27 A perforation in the Maxilla Superior.
28 Dentes Inciſorii
29 Dens Caninus.
30 Dentes Molares.
31 Sinus Sphenoidalis

TABLE IX.

A, A BONE taken out of the mufcular part of the heart of a man. Vide page 7.

B, A bone taken out of the firft procefs of the Dura Mater not far from the Crifta Galli.

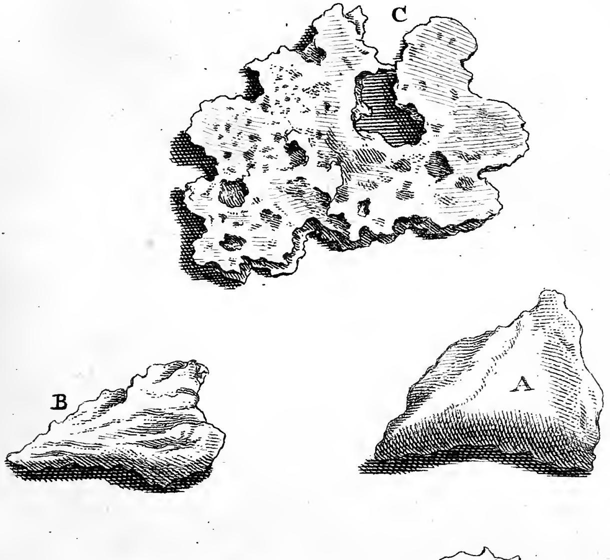
C, D, The two bones mentioned, page 54.

C, Shews the under fide of that part of the Os Bregmatis that was depreffed.

D, The piece of bone that feparated laft, and which was not depreffed.

E, The two places firft trephined.

F, The place laft trephined to give more vent to the matter.



G. V.der Gucht Sculp.

Pag. 69 Tab. X

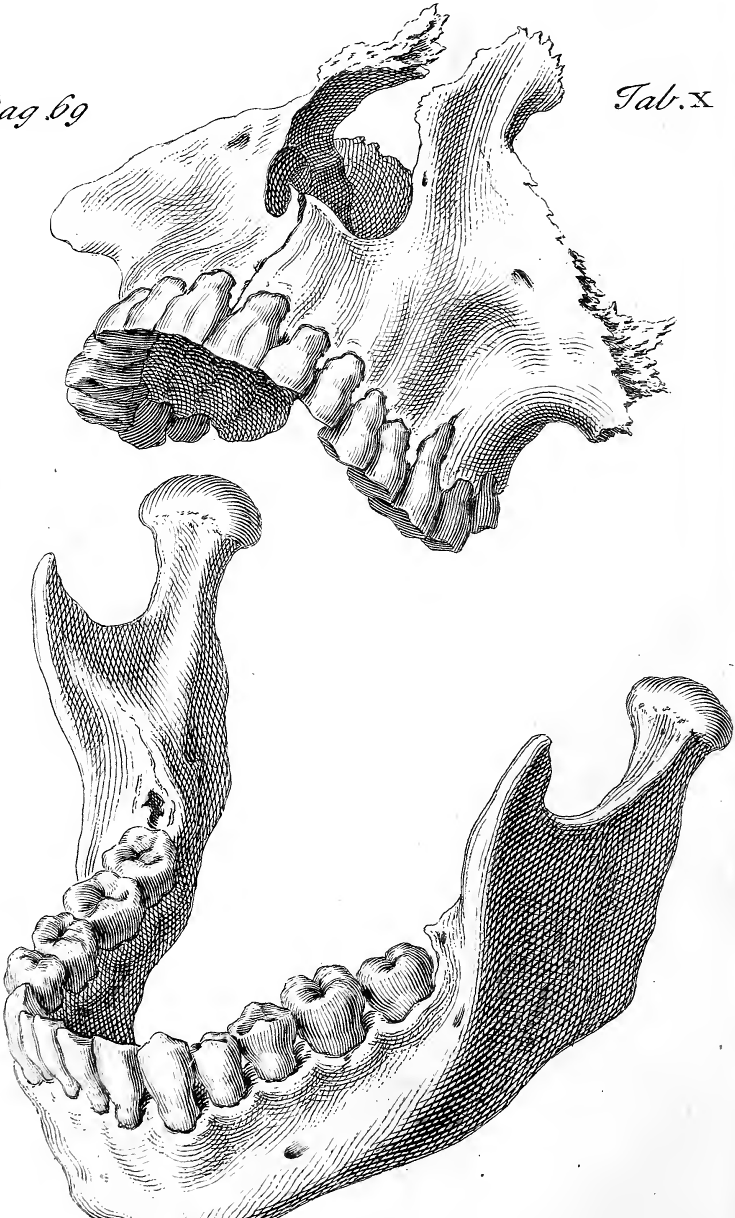


TABLE X.

THE upper and lower jaw, being a ſpecimen of an Oſteology in folio, in which every bone will be done as large as the life.

BOOK II.

CHAP. I.

Introduction to the Muſcles.

THE muſcles are moving powers, applied to perform the ſeveral motions of the body; which they do by contracting their length, and thereby bringing the parts to which they are fixed nearer together. The immovable or leaſt moved part any muſcle is fixed to, is uſually called its origin, and the other its inſertion; but muſcles that have their two ends equally liable to be moved, may have either called their origins or inſertions.

EACH muſcle is made up of a number of ſmall fibres which Borelli and others have thought to be ſtrings of bladders, and have endeavoured to account for muſcular motion by an expanſion made from an influx of blood and animal ſpirits into theſe bladders; but as the muſcles do not increaſe their bulk ſenſibly in contract-

ing, there needs no more to be ſaid to refute this hypotheſis. (See Dr. Pemberton's introduction to Cowper on the muſcles.) But Dr. Keil thought that in this way the muſcles might be contracted by a ſwelling, ſcarce ſenſible, if the bladders are but very ſmall: For, ſays he, ſuppoſing a bladder of any determined bigneſs can raiſe a weight a foot, a hundred bladders whoſe diameters are each a hundredth part of the former will raiſe the weight to the ſame height; but the force of inflation and the ſwelling of all together will be ten thouſand times leſs, and it will alſo raiſe ten thouſand times leſs weight, which he has not obſerved; therefore not one ſuch ſtring of bladders, but ten thouſand muſt be applied to do the ſame thing that the one bladder will do: and they will have the ſame ſwelling, otherwiſe it would be eaſy to ſhew how to make a Perpetuum Mobile of prodigious force. For the diſcovery of this miſtake in Dr. Keil, I am obliged to Dr. Oldfield.

The muſcles are of two ſorts, viz. rectilineal and penniform. The former have their fibres almoſt parallel in the ſame or near the ſame direction, with the Axis of the muſcle; and the latter have their fibres joined in an oblique direction, to a tendon paſſing in or near the Axis, or on their outſide.

The

The rectilineal muscles, if their origins and insertions are in little compass, are never of any considerable thickness, unless they are very long, because the outward fibres would compress the inner ones, and make them almost useless; and therefore every rectilineal muscle, whose inner fibres are compressed by the outer, have their inner fibres longer than the external, that they may be capable of equal quantity of contraction.

The Penniform muscles, though they are in a manner free from the inconvenience of one fibre compressing another, and though by the obliquity of their fibres, nothing is abated of their moment, as is clearly demonstrated by an experiment of Mr. Hawksbee's, where it is shewn, Tab. xii.
that in all cases, just so much more weight as rectilineal fibres will raise than oblique ones, the oblique will move their weight with just so much greater velocity than the rectilineal; which is making their moments equal: So that in the structure of an animal, like all mechanic engines, whatever is gained in strength is lost in velocity, and whatever is gained in velocity is lost in strength. Yet the fibres of the penniform muscles becoming more and more oblique as they contract, their strength decreases, and their velocity increases, which makes them less uniform in their actions than the rectilineal muscles; wherefore it seems that

nature never uses a penniform muscle where a rectilineal muscle can be used; and the cases in which a rectilineal muscle cannot be used, are where the shape of a muscle is such as that the inward fibres would be too much compressed, or where rectilineal fibres could not have a lever to act with, suitable to their quantity of contraction, which is the case of all the long muscles of the fingers and toes; for every muscle must be inserted or pass over the centre of motion of the joynt it moves, at a distance proportionable to its quantity of contraction, and the quantity of motion in the joynt moved; for if it was inserted too near, then the motion of the joynt would be performed before the muscle is contracted all that it can; if too far off, the muscle will have done contracting before the whole motion of the joynt is made; and though the quickness and quantity of motion in a muscle will be, Cæteris Paribus, as the length of its fibres; for if a fibre four inches long will contract one inch in a given time, a fibre eight inches long will contract two inches in the same time; and the strength of a muscle or power to raise a weight, Cæteris Paribus, will be as the number of its fibres; for if one fibre will raise a grain weight, twenty fibres will raise twenty grains. Nevertheless, two muscles of equal magnitude, one long, and the other short, will both move the same weight with

the ſame velocity when applied to a bone; becauſe the levers they act with muſt be as their lengths, and therefore the penniform and ſhort thick muſcles are never applied to a bone for the ſake of ſtrength, nor long fibred muſcles for quickneſs; for whatever is gained by the form of the muſcle, whether ſtrength or quickneſs, muſt be loſt by their inſertions into the bone, or elſe the muſcles muſt not act all they can, or the bones have leſs motion than they are fitted for.

IN the limbs ſeveral muſcles paſs over two joynts, both of which they are liable to move at once, with force proportionable to the levers they act with upon each joynt; but either joynt being fixed by an antagoniſt muſcle, the whole force of ſuch muſcles will be exerted upon the other joynt; which in that caſe may be moved with a velocity equal to what is in both joynts, when theſe muſcles act upon both at once. This mechaniſm is of great uſe in the limbs, as I ſhall ſhew in the proper places.

THAT only we call the proper uſe and action of any muſcle which it has without the neceſſary aſſiſtance of any other muſcle, and what that is in a muſcle moving a joynt we may always know, and with what force it acts, Cæteris Paribus, by dropping a line from the center of motion of the joynt, it moves perpendicular into the Axis of the muſcle in any ſituation; but in

in a joynt which admits only of flexion and extension, this line must also be perpendicular to the Axis of motion in that joynt, and the action of the muscles will be in the direction of that perpendicular line, and the force with which it acts in any situation will be Cæteris Paribus as the length of that perpendicular line.

Each muscle, so far as it is distinct and is moved against any part, is covered with a smooth membrane to make the friction easy; but where they are externally tendinous those tendons are often smooth enough to make such a covering needless. Besides this membrane there is another, known by the name of Fascia Tendinosa, which deserves to be particularly considered. The strong one on the outside of the thigh, which belongs to the Fascialis and Gluteus muscles is of great use in raising the Gluteus farther from the centre of motion of the joynt it moves, to increase its force: in like manner the Fascia detached from the tendon of the Biceps Cubiti alters its direction for the same purpose, but those on the outside of the Tibia and Cubit, &c. are only flat tendons from which the fibres of the muscles arise as from the bones. There are also in many places such tendons between the muscles, from which each muscle arises in like manner, for the bones themselves are not sufficient to give origin to half the fibres of the muscles that belong to them; besides, if

if all the fibres had rise from the bones they must have been liable to compress one another very inconveniently.

CHAP. II.
Of the Muscles.

OBLIQUUS DESCENDENS, arises fleshy from near the extremities of the eight inferior ribs, the upper part of its Origin being indented with the Serratus Major Anticus, and the lower laying under a small portion of the Latissimus Dorsi. It is inserted fleshly into the upper part of the spine of the Ilium, and by a broad flat tendon (which firmly adheres to a like tendon of the following muscle as they pass over the Rectus) into the Os Pubis, and Linea Alba, which is a strong tendinous line extended from the Os Pubis to the Sternum, between the Musculi Recti. Muscles of the Abdomen. Tab. xii 9.

OBLIQUUS ASCENDENS, arises fleshy under the former muscle from the spine of the Ilium, and is inserted fleshy in the cartilages of the three lowest ribs, and by a flat tendon into the Sternum, aud Linea Alba, together with the tendon of the foregoing muscle. The line in which these two tendons join on the outside

ſide of the Rectus muſcle, is called Semilunaris: And though ſo much of this muſcle as is inſerted fleſhy runs obliquely upward, yet the middle and lower part is directed tranſverſe and downward; and beſide the tendon which it unites with the Obliqus Deſcendens, it often detaches another near the Sternum to be inſerted with the Tranſverſalis under the Rectus.

Tab. xii. 11. PYRAMIDALIS, ariſes from the Os Pubis, and is inſerted into the Linea Alba about three or four inches below the navel: This and its fellow are often wanting.

Tab. xii. 10. RECTUS, ariſes tendinous from the Os Pubis; but fleſhy when the Pyramidales are wanting, and is inſerted into the lower part of the Sternum near the Cartilago Enſiformis. This muſcle is divided into four or five portions by tranſverſe tendinous interſections, that it might conveniently bend when the body is bowed forwards, though this muſcle ſhould be then in action; and theſe interſections are chiefly above the navel, where it is moſt liable to be bent: beſides being thus divided its chief preſſure will not be in its middle, but under the ſeveral bellies of the muſcle, and the greateſt below the navel, where is the longeſt fleſhy belly of this muſcle, and where the parts in the Abdomen ſeem to want moſt to be ſupported.

TRANSVERSALIS, ariſes by a flat tendon from the tranſverſe proceſſes of the lumbal Vertebræ,

tebræ, and fleſhy from the inſide of the ribs below the Diaphragm, and from the ſpine of the Ilium, then becoming a flat tendon, it paſſes under the Rectus to its inſertion into the Linea Alba. Between this tendon and the Peritoneum, ſometimes water is found in great quantities, which diſtemper is called the dropſy in the duplicature of the Peritoneum, which ſhews this membrane has been miſtook for part of the Peritoneum.

THESE five pair of muſcles all conſpire to compreſs the parts contained in the Abdomen. The Obliquus Deſcendens on the right ſide, and Aſcendens on the left acting together, turn the upper part of the trunk of the body towards the left, & Vice Verſa; but the trunk is chiefly turned upon the thighs: the Recti bend the body forward, and pull the Sternum downward in expiration; the two oblique muſcles and the tranſverſe on each ſide near the groins, are perforated to let through the Proceſſus Vaginalis with the ſpermatick veſſels. Theſe perforations are diſtant from each other, ſo as to ſuffer the veſſels to deſcend conveniently into the Scrotum; this way the inteſtines or the Omentum, deſcend in ruptures.

CREMASTER TESTIS, is a ſmall portion of fibres which ariſes from the Ilium, and appears to be part of the Obliquus Aſcendens muſcle, till it meets with the ſpermatick veſ- Muſcles of the Teſtes.

ſels

ſels at their coming out of the Abdomen, where it begins to deſcend with them by the ſide of the Proceſſus Vaginalis, to the teſticle, over which it is looſely expanded. This muſcle is too ſmall to be plainly diſcovered in emaciated bodies.

Muſcles of the Penis.

Erector Penis, ariſes from the Os Iſchium, and is inſerted into the Crus Penis near the Os Pubis. It is ſaid, by preſſing the Penis againſt the Os Pubis, to compreſs the Vena Ipſius Penis, and hinder the reflux of blood, whereby the Penis becomes extended and erect; but it does not appear to me to be well contrived for that uſe.

Accelerator Urinæ: This, with its fellow, are but one muſcle; it ariſes tendinous from the Oſſa Iſchia, and fleſhy from the Sphincter Ani, or according to Mr. Cowper from the ſuperior part of the Urethra as it paſſes under the Os Pubis: and thence being expanded over the bulb of the Urethra; it afterwards divides, and is inſerted into the Penis. The uſe of this muſcle is not to accelerate the urine, for that is propell'd by the Detruſor Urinæ, or muſcular coat of the bladder, but to protrude the Semen, which is done only by this; and it being ſeated oppoſite to the Os Pubis, it ſeems to be much better fitted to be a relaxer of the Penis by pulling it from the Os Pubis, than the Erector is for the office aſſigned it.

Transver-

Transversalis Penis is that part of the former mufcle which arifes from the Offa Ifchia.

Sphincter Vesicæ Urinariæ is a fmall portion of mufcular fibres, not eafily to be diftinguifhed, running round the neck of the bladder to prevent the involuntary effufion of urine. Mufcles of the bladder.

Detrusor Urinæ, is the mufcular coat of the bladder; its fibres are differently difpofed; but chiefly terminating in the Sphincter Veficæ, whereby it not only preffes the urine forward, but when the bladder is full, becomes an antagonift to the Sphincter, acting almoft at right angles.

Erector Clitoridis, arifes from the Ifchium, and is inferted into the Crus Clitoridis, like the Erector Penis in men, and is faid, to caufe erection in the fame manner. Mufcles of Clitoris.

Sphincter Vaginæ, is an order of mufcular fibres intermixed with membranous fibres furrounding the Vagina Uteri near its orifice; it is conected to the Offa Pubis and Sphincter Ani; its ufe is to conftringe the orifice of the Vagina, to prefs out a liquor from the glands of the Vagina, and embrace the Penis in coition. Mufcles of the Vagina.

Dr. Douglas mentions two pair of mufcles of the Vagina of his own difcovering, which I have never diffected, and will therefore give them in his own words: The firft arifes from

 the

the inner edge of the Os Pubis mid-way between the Iſchion and the beginning of the Crus Clitoridis, is inſerted into the Vagina; the ſecond ariſes tendinous and fleſhy from the Os Pubis internally in common with the Levator Ani, is inſerted into the upper part of Vagina at the ſide of the Meatus Urinarius or Collum Veſicæ.

Muſcles of the Anus.

SPHINCTER ANI, is a muſcle near two inches in breadth, ſurrounding the Anus to cloſe it, and to prevent involuntary falling out of the Fæces.

LEVATOR ANI, by Dr. Douglaſs, called two pair of muſcles, but Mr. Cowper deſcribes the whole as one muſcle only, which ariſes from the Oſſa Iſchii, Pubis, and Sacrum within the Pelvis, and is inſerted round the lower end of the Rectum Inteſtinum.

FISTULA's in Ano, that are within this muſcle, generally run in the direction of the gut, and may be laid open into the gut with great ſafety; but thoſe fiſtula's, or rather abceſſes that are frequently formed on the outſide of the Sphincter, and uſually ſurround it, all but where this muſcle is connected to the Penis, cannot be opened far into the gut, without totally dividing the Sphincter, which, Authors ſay, renders the Sphincter ever after uncapable of retaining the excrement. One inſtance of this kind I have known; but

but Mr. Berbeck, of York, an excellent Surgeon, and particularly famous for this operation, has assured me, that he has often been forced to divide the Sphincter, which has made the patients unable to hold their excrements during their cure, but the wounds being healed, they have retained them as well as ever.

Muscles of the Os Coccygis.

Coccygei arise from the acute processes of the Ossa Ischii, and are inserted into the Os Coccygis, which they pull forward.

Muscles of the Scalp. Tab. x. A.

Occipito-Frontalis, is a muscle with four fleshy bellies, commonly named Frontales and Occipitales. It arises behind each ear from the Os Occipitis, and soon becoming tendinous, passes under the hairy scalp to the forehead, where it becomes broad and fleshy, adhering to the skin, and is inserted into the upper part of the orbicular muscles of the eye-lids into the Os Frontis near the nose, and by two processes into the bones of the nose. When this muscle acts from the back-part, it pulls the skin of the forehead upward, and wrinkles it transverse, and in some persons the hairy scalp backwards; but when the forepart of it acts, it draws the skin with the eye-brows downward, and towards the nose when we frown. The tendon of this muscle has been mistaken for a membrane, and been called Pericranium, and the true Pericranium, Periosteum.

Muscles of the external ear.

Elevator Auriculæ, arises from the tendon of the Occipito-Frontalis, and is inserted into the upper part of the ear that is connected to the head.

Retractor Auriculæ, arises by one, two or three small portions from the temporal bone above the mamillary process, and is inserted into the ear to pull it backward.

Muscles of the eye-lids. Tab.x D.

Orbicularis Palpebrarum, surrounds the eye-lids on the edge of the orbit, and is fixed to the Sutura Transversalis at the great corner of the eye; it shuts the eye-lids, especially in winking. That part of this muscle that lies under the eye-brow is very much intermixed with the Occipito-Frontalis, and under it from the Os Frontis near the nose, arises a small portion of distinct fibres which end in this muscle, and, I think, are a part of it; nevertheless, from the effect of their Action, are not improperly called Musculus Corrugator.

Ciliaris, is a very small portion of this muscle, next the ciliary cartilages of the eye-lids.

Elevator Palpebræ Superioris Rectus, arises above the optick nerve, from the Periosteum at the bottom of the orbit (as do also the five following muscles) and is inserted into the whole ciliary cartilage of the upper eye-lid by a very thin flat tendon.

Elevator

Elevator Oculi, ariſes from the bottom of the orbit, between the optick nerve and the foregoing muſcle, and is inſerted into the upper part of the Tunica Sclerotis of the eye, near the Cornea. Muſcles of the eyes. Tab.x.Q.

Depressor Oculi, ariſes, and is inſerted directly oppoſite to the laſt deſcribed muſcle. Tab.x.R.

Adductor Oculi, ariſes from the bottom of the orbit, near the optick nerve internally, and is inſerted into the Tunica Sclerotis on the ſide next the noſe. Tab.x.S.

Abductor Oculi, has both its origin and inſertion, directly oppoſite to the Adductor. Tab.x.T.

Obliquus Superior Seu Trochlearis, ariſes between the Elevator and Adductor Oculi at the bottom of the orbit, thence aſcending by the Sutura Tranſverſalis, becomes a round tendon, which paſſing through a pulley at the upper and inner part of the orbit near its edge, is inſerted near the bottom of the globe of the eye, which it pulls upward and inward, and thereby directs the pupil outward and downward. Tab.x.N. Tab.x.O.

Obliquus Inferior, ariſes from the Os Maxillæ Superioris, at the the edge of the orbit; thence paſſing over the Depreſſor is inſerted near the Abductor at the bottom of the eye, but not ſo low as the inſertion of the Ob- Tab.x.P.

 liquus

liquus Superior: It turns the pupil upward and outward.

These muſcles are inſerted with great Advantage to move a ſmall weight, and are very long, that the eye may be moved with ſufficient quickneſs. The two oblique muſcles are an Axis to the motions of the other four, and acting ſtrongly againſt them, (which action I take to be what is vulgarly called ſtraining the eye) may, I think, bring the cryſtalline humour nearer to the Retina, and even make the cryſtalline humour more flat to fit the eye for objects at a great diſtance; for this end it ſeems to me that there are ſix muſcles thus diſpoſed, when three would be ſufficient to turn the eye every way, if it was in a fixed ſocket; and it ſeems alſo that while the muſcles are all thus in action, the ſuperior oblique in each eye ſets the pupil farther from the noſe, while the inferior oblique directs it upward; the firſt of which actions is always neceſſary, and the latter often ſo, when we look with both eyes at very diſtant objects; and when the two oblique muſcles grow weak by age or diſeaſe, or ceaſe to act at all, as in paralytick caſes, and death, then the eye ſinks in the orbit.

Muſcles of the Lips. Tab. x. E.

Sphincter or Constrictor Oris, ſurrounds the mouth about three fourths of an inch broad. This muſcle is very much intermixed with all the muſcles that are inſerted into it.

Ele-

Elevator Labii Superioris Proprius, ariſes from the bone of the upper jaw under the anterior and inferior part of the Orbicularis Palpebrarum, and uſually takes another ſmall beginning from the Os Malæ, which ſeems as if it was ſent off from the Orbicularis Palpebrarum; and paſſing down by the ſide of the noſe, into which it ſends ſome fibres, is inſerted into the upper part of the Sphincter Oris. This raiſes the upper lip, and helps to dilate the noſtrils. Tab. x. F.

Depressor Labii Superioris Proprius, is a ſmall muſcle ariſing from the upper jaw near the Dentes Inciſorii, and is inſerted into the upper part of the lip and root of the cartilages of the noſe; hence it is alſo a depreſſor of the noſe, which action conſtricts the noſtrils.

Depressor Labii Inferioris Proprius, ariſes broad from the lower jaw at the chin, and is ſoon inſerted into the Sphincter Oris; the order of fibres in this ſeems not ſo conſpicuous as in the other muſcles of the face. Tab. xiii. I.

Elevator Labii Inferioris Proprius, ariſes from the lower jaw, near the Dentes Inciſorii, and is inſerted into the lower part of the lip.

Elevator Labiorum Communis, ariſes from a depreſſed part of the Superior Tab. xiii. G.

 Maxilla

Maxilla under the middle of the orbit, and is inſerted into the Sphincter muſcle near the corner of the mouth.

Tab. xiii. H. DEPRESSOR COMMUNIS LABIORUM, ariſes laterally from the lower jaw near the chin, and is inſerted into the Sphincter, oppoſite to the former.

Tab. xiii. K. ZYGOMATICUS, ariſes from the anterior part of the Os Zygoma or Malæ, and frequently derives a portion of fibres from the Orbicularis Palpebrarum, thence running obliquely downwards; it is inſerted into the Sphincter at the corner of the mouth, betwixt the Elevator Communis and Buccinator; it draws the corner of the mouth outward and upward. When this muſcle grows weak, the corner of the mouth ſinks, as may be obſerved in old perſons.

Tab. xiii. L. BUCCINATOR, ariſes from the Proceſſus Corone of the lower jaw, and paſſing contiguous to both jaws, is inſerted into the Sphincter muſcle at the corner of the mouth. It ſerves either to force breath out of the mouth, or thruſt the aliment between the teeth in maſtication, or to pull the corner of the mouth outward.

PLATYSMA MYOIDES, ariſes looſely from over the pectoral and part of the deltoid muſcle, and running obliquely forward, is inſerted into the chin, and depreſſor muſcles of the lips. This muſcle being exceeding thin (a

mere

mere Membrana Carnosa) serves to cover the unequal surface of the subjacent muscles, and render the neck even; it also pulls down the corner of the mouth, and from its insertion at the chin, may contribute to the pulling down of the lower jaw.

Muscles of the nose.

RETRACTOR ALÆ NASI, is a very small muscle arising from the bone of the nose, and is inserted into the skin and cartilage at the side of the nose.

Muscles of the Os Hyoides.

MYLOHYOIDEUS, with its fellow, may be esteemed one penniform or else a digastrick muscle: It arises from the Linea Aspera on the inside of the lower jaw and Processus Innominatus, both sides meeting at about right angles in a middle line upon the following muscles. It is inserted by a small portion of fibres into the Basis of the Os Hyoides; it moves the tongue upward and forward, and also compresses the following muscles, whereby they raise the tongue more commodiously, and also hinders them from drawing the Basis of the Os Hyoides into a right line betwixt the chin and Sternum at such times as the Stylohyoidei cannot act.

GENIOHYOIDEUS, arises from the Processus Innominatus of the lower jaw, under the foregoing muscle, and is inserted into the Basis of the Os Hyoides, which it pulls upward and forward.

forward. This with its fellow, are for the moſt part but one muſcle.

STYLOHYOIDEUS, ariſes from the Proceſſus Styliformis near its root, and paſſing contiguous to the horn of the Os Hyoides becomes inſerted lateraly into its Baſis. This muſcle is ſometimes perforated about the middle by the tendon of the digaſtrick muſcle of the lower jaw. Its uſe is to pull the Os Hyoides up and backward.

Tab. xii. 3. CORACOHYOIDEUS, ariſes from the upper Coſta of the Scapula near the Proceſſus Coracoides, and paſſing under the Maſtoideus muſcle becomes in that place a round tendon; thence paſſing almoſt parallel to the following muſcle, is inſerted together with it into the Baſis of the Os Hyoides; this draws the Os Hyoides downward, and a little backward. I have once ſeen one of theſe muſcles wanting, and the Sternohyoideus ariſing from the middle of the clavicle on that ſide.

Tab. xii. STERNOHYOIDEUS, ariſes from a roughneſs at the under part of the Clavicula near the Sternum, and the cartilaginous part of the firſt rib; and is inſerted into the Baſis of the Os Hyoides, to pull it downward.

Muſcles of the tongue.

GENIOGLOSSUS, ariſes from the Proceſſus Innominatus of the lower jaw, and is inſerted broad into the under part of the tongue, to

to pull it up and forward, and ſometimes has a ſmall inſertion into the Os Hyoides.

BASIOGLOSSUS ſeems a portion of the former muſcle; it ariſes from the Baſis of the Os Hyoides, and is inſerted into the tongue nearer its tip.

CERATOGLOSSUS, ariſes from the horn of the Os Hyoides, and is inſerted laterally into the tongue near its root, to pull it downward and forward.

STYLOGLOSSUS, ariſes from the extremity of the Proceſſus Styliformis, and is inſerted into the tongue near the former to pull it up and backward. I have very often found another ſtyloid muſcle ſo inſerted, that I cannot tell whether to call it a muſcle of the tongue or Pharynx.

THE Tongue is a muſcle made of fibres, longitudinal, circular, and tranſverſe, ſo intermixt as beſt to ſerve its ſeveral motions.

HYOTHYROIDEUS or CERATOTHYROIDEUS, ariſes from part of the Baſis, and the horn of the Os Hyoides, and is inſerted into the lower part of the Cartilago Thyroides, to pull it upward. Muſcles of the Cartilago Thyroides.

STERNOTHYROIDEUS, ariſes from the inſide of the Sternum, and is inſerted with the former; it pulls the thyroid cartilage directly downward.

CRICO-

Cricothyroideus, ariſes from the anterior part of the Cartilago Cricoides, and running obliquely upward and outward, is ſoon inſerted into the inſide of the Cartilago Thyroides, which it pulls towards the Cartilago Cricoides. Both this muſcle and its fellow, for the moſt part appear double.

Muſcles of the Cartilago Arytænoides.

Cricoarytænoideus Posticus, ariſes from the back-part of the Cartilago Cricoides, and is inſerted into the Arytænoides to pull it backward.

Cricoarytænoideus Lateralis, ariſes laterally from the Cartilago Cricoides, and is inſerted laterally into the Arytænoides. This with its fellow, pull down each cartilage toward their origin, and thereby dilate the Rimula.

Thyroarytænoideus, ariſes from the ſuperior, middle, and inner part of the Cartilago Thyroides, and is inſerted with the former into the Arytænoides cartilage to dilate the Rimula. Theſe two laſt deſcribed muſcles are not naturally divided, and therefore ought to be accounted but one muſcle.

Arytænoideus, is one ſingle muſcle ariſing from one arytænoidal cartilage, and is inſerted into the other to draw them together, and cloſe the Rimula. Theſe few ſmall muſcles of the tongue and Larynx, with only one pipe, make a greater variety of notes and ſounds than can be made by artificial inſtruments, and that

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in a manner fo little underftood by us, and by organs fo little differing from thofe in quadrupeds, that for ought we know of them, brutes might be as capable of all thefe founds as men.

Mufcles of the Pharynx.

STYLOPHARYNGEUS, arifes from near the bottom of the Proceffus Styloides of the Os Petrofum, and running obliquely downward, is inferted into the Pharynx. This mufcle with its fellow, pulls up and dilates the Pharynx to receive the aliment.

ŒSOPHAGEUS, arifes like a wing from feveral parts of the fcull, tongue, Os Hyoides, the cricoid and thyroid cartilages, and is inferted into the Pharynx. This with its fellow, conftringe the Pharynx, and prefs the aliment down the gullet.

MUSCULUS VAGINALIS GULÆ, is the mufcular coat of the Gula.

PTERYGOPHARYNGEUS, is not a diftinct mufcle, but the beginning of the Pharynx near the Proceffus Pterygoides, of the fphenoidal bone.

Mufcles of the Palate.

PTERYGOSTAPHYLINUS INTERNUS, arifes from the Os Sphenoides, near the Iter ad Palatum, or Euftachian tube, and is inferted into the Uvula, which it pulls up while we breath through the mouth or fwallow.

PTERYGOSTAPHYLINUS EXTERNUS, arifes by the fide of the laft defcribed mufcle, and is alfo inferted near it; but becomes its anta-

antagoniſt by being reflected on a pulley, over a proceſs at the lower part of the pterygoidal proceſſes of the ſphenoidal bone.

Glosso-Staphylinus, is a very ſmall portion of muſcular fibres, which paſs from the tongue to the palate, which it pulls down when we breathe through the noſe.

The palate it ſelf is a ſort of double muſcle, whoſe action ſeems only to ſupport it ſelf and aſſiſt thoſe muſcles which pull it upwards.

Muſcles of the lower jaw.

Digastricus, ariſes from the Sinus of the mamillary proceſs of the Os Temporis, and from a fleſhy belly, becoming a round tendon, paſſes through, and ſometimes under the Stylohyoideus muſcle; and then being tyed down by a ligament to the Os Hyoides, grows fleſhy, and is ſo inſerted into the anterior part of the lower jaw internally. This muſcle's direction being altered by its being tyed to the Os Hyoides, where it makes an angle, (and not at its paſſage through the Stylohyoideus) pulls the lower jaw downward with much greater force than otherwiſe it could have done: and being connected to the Os Hyoides, when it acts it prevents the action of ſeveral muſcles which are concerned in ſwallowing; whence it is that we cannot ſwallow at the ſame time, that we open the jaw, as thoſe brutes can whoſe digaſtric muſcles are not connected to that bone.

Tempo-

Temporalis, arises from the Os Frontis, Parietale, Sphenoides, Malæ and Temporis, and passing under the two processes named Os Jugale, is inserted externally into the Processus Coronæ of the lower jaw, which it pulls upward. This muscle is covered with a strong tendinous Fascia. Tab. xiii. B.

Masseter, arises from the lower edge of the Os Malæ or Zygoma, and the process which joins this from the temporal bone, and is inserted to the outer part of the angle of the lower jaw, which it pulls up and forward. These two last described muscles having different Directions, when they act together, make a steady motion in the diagonal of their directions. Tab. xiii. C.

Pterygoideus Internus, arises from the Processus Pterygoideus Externus, and from the Sinus between the pterygoid processes, and is inserted internally into the angle of the lower jaw, which it pulls upward.

Pterygoideus Externus, arises from the Os Maxillare, and Os Sphenoides, near the root of the external pterygoid process, and is inserted internally into the Processus Condyloides of the lower jaw, which it pulls to one side, and forwards, or acting with its fellow pulls the jaw directly forwards.

Subclavius, arises from the superior part of the first rib, and is inserted into more Muscle of the Clavicula.

 than

than half the underside of the clavicle next the Scapula. Its use is to draw the Clavicula toward the Sternum, that they may not be severed in the motions of the Scapula.

Muscles of the Scapula. Tab. xiii. 2.

TRAPEZIUS, arises from the Os Occipitis, and from a Linea Alba Colli, from the spinal process of the last Vertebra of the neck, and the ten uppermost of the back, and from a Linea Alba between all these Processes, and is inserted into one third of the clavicle next the Scapula, almost all the back part of the spine of the Scapula, and as much of the Processus Acromion as lies between the spine of the Scapula and the clavicle. This muscle draws the Scapula directly backward.

IT is generally said by authors, that the several parts of this muscle act at different times, and so pull the Scapula different ways, as obliquely upward, downward or backward; but, I think, if that happened, it must necessarily divide this muscle into distinct portions, those that contract always separating from those that do not.

Tab. xiii. 4.

RHOMBOIDES, arises tendinous under the former from the spinal process of the Inferior Vertebra of the neck, part of the Linea alba Colli, and from the spinal processes of the four or five uppermost Vertebræ of the Thorax, and is inserted into the Basis of the Scapula, which it pulls up and backward. The upper

part of this muſcle ariſing from the neck, is in many bodies, by the motions of the neck, ſeparated and made a diſtinct muſcle.

ELEVATOR SCAPULÆ, ariſes from the tranſverſe Proceſſes of the four ſuperior Vertebræ of the neck, and is inſerted into the upper angle of the Scapula.

SERRATUS MINOR ANTICUS, ariſes under the Pectoralis, from the third, fourth and fifth ribs, and is inſerted into the Proceſſus Coracoides Scapulæ; which it pulls forward and downward. This muſcle is always ſaid to be an Elevator of the ribs, though it ariſes from the Scapula, which is ſupported by the ribs.

SEURRATUS MAJOR ANTICUS, ariſes from the anterior part of the eight ſuperior ribs, and is inſerted into the Baſis of the Scapula, which it draws forward, and by that means moves the ſocket of the Scapula upward. This muſcle has been always accounted an Elevator Coſtarum, though each portion of it is nearly parallel to the rib it riſes from.

ALL the muſcles inſerted into the Baſis of the Scapula, are alſo inſerted into one another.

Muſcles of the Humerus. Tab. xii. 7.

PECTORALIS, ariſes from near two thirds of the Clavicula, next the Sternum, and all the length of the Os Pectoris, and from the cartilages of the ribs, and is inſerted into the Os

Humeri, between the Biceps and the inſertion of the Deltoides. The uſe of it is to draw the arm forward. A ſmall portion of the lower part of this muſcle is often confounded with the Obliquus Deſcendens Abdominis; and in ſome bodies, neither the upper part, nor its tendon, can be eaſily ſeparated from the Deltoides; and in others, even that part of it that ariſes from the Clavicula, is a diſtinct portion. Near the inſertion of this muſcle, the fibres croſs thoſe from below, ending above in the arm, and thoſe from above below, that the tendon of this muſcle might not lie inconveniently low between the arm and Thorax, as it would have done, had the fibres which ariſe loweſt from the Sternum been inſerted loweſt in the arm: but this croſſing does not make the tendon at all ſtronger, as is often ſaid; nor can I ſee how it came to be thought that this tendon ſhould want more ſtrength in proportion, than other tendons.

Tab.xii.6. DELTOIDES, ariſes exactly oppoſite to the inſertion of the Trapezius, from one third part of the Clavicula, from the Acromion and ſpine of the Scapula, and is inſerted tendinous near the middle of the Os Humeri, which bone it lifts directly upward. The outermoſt parts of this muſcle, when the arm hangs down, lie below the center of motion of the joint, and therefore can have no ſhare in lifting the Humerus

Humerus up till it is raiſed part of the way by the other part of this muſcle, and the following muſcle; and as the outer parts of this muſcle begin to act, the following muſcle acts with leſs advantage: And it ſeems to me, that the ſole reaſon why this muſcle is made of ſo many parts, is, that they may act independently; for it is demonſtrable, that this muſcle, when the whole of it acts, cannot raiſe the arm with ſo great advantage as a right-lined muſcle of the ſame magnitude would have done.

SUPRASPINATUS, ariſes from the Dorſum Scapulæ above the ſpine, and paſſing between the two proceſſes, is inſerted into the upper part of the Os Humeri, which it helps to raiſe, until it becomes parallel with the Spina Scapulæ.

THE Supraſpinatus, the Deltoides and Coracobrachialis, aſſiſt in all the motions of the Humerus, except depreſſion; it being neceſſary that the arm ſhould be raiſed and ſuſtained, in order to move it to any ſide.

INFRASPINATUS, ariſes from the Dorſum Scapulæ below the ſpine, and is inſerted (wrapping over part of it) at the ſide of the Head of the Os Humeri; it turns the arm ſupine and backward; for there is a prone and ſupine rotatory motion of the Humerus of near 90 Degrees. Tab. xiii. 8.

Teres Minor, is a ſmall muſcle ariſing below the former from the Inferior Coſta Scapulæ, and is inſerted together with it. It aſſiſts the former in turning the arm ſupine, but pulls it more downwards.

Tab. xiii. 7. Teres Major, ariſes from the lower angle of the Scapula, and is inſerted at the under part of the Os Humeri about three fingers breadth from the Head. This draws the Os Humeri toward the lower angle of the Scapula, and turns the arm prone and backward.

Tab. xiii. 6. Latissimus Dorsi, ariſes by a flat tendon from the ſpinal proceſſes of the ſeven or eight inferior Vertebræ of the back, and thoſe of the loyns, Sacrum and Ilium; and growing fleſhy after it has paſſed the extenſors of the trunk, receives another ſmall fleſhy beginning from the ninth, tenth and eleventh ribs, and is inſerted into the Os Humeri, with the former. This turns the arm backward and prone. The tendon of this muſcle ſerves for a membrane to the extenſors of the back, and is connected to the tranſverſe proceſſes of the Vertebræ Lumborum.

Subscapularis, ariſes from the hollow ſide of the Scapula, which it fills up, and is inſerted into the head of the Os Humeri, wrapping ſomewhat over it. This pulls the arm to the ſide, and prone.

Cora-

Coracobrachialis, ariſes from the Proceſſus Coracoides Scapulæ, in common with the inſertion of the Serratus Minor Anticus, and is inſerted into the Os Humeri internally about its middle. This raiſes the arm, and turns it ſomewhat outward.

Biceps Cubiti Flexor, ariſes with two heads, (that the fibres of this muſcle might not compreſs one another;) one from the Proceſſus Coracoides Scapulæ, in common with the Coracobrachialis muſcle, and the other by a round tendon from the edge of the Acetabulum Scapulæ, which paſſing in a Sulcus of the Os Humeri, afterward becomes fleſhy, and joyns the firſt head to be inſerted with it into the tubercle of the Radius; and ſometimes this muſcle has a third head, which ariſes from the middle of the Os Humeri. This muſcle lifts up the Humerus, bends the cubit, and has as great a ſhare as any one muſcle in turning the cubit ſupine; the Humerus being fixed by other muſcles, the whole force of this muſcle will be exerted upon the cubit, or the cubit being fixed by an Extenſor, the whole force of it will be ſpent in raiſing the arm, and therefore ought to be always reckoned among thoſe that raiſe a weight at arms length. A puncture of the tendinous expanſion of this muſcle is ſuppoſed to be always attended with grievous pain and inflammation, and has, if we have

Muſcles of the Cubit. Tab. xii. 12.

not miſtaken the cauſe, ſometimes proved mortal; yet the beſt of ſurgeons, and particularly Mr. Cowper, has given us inſtances of larger tendons being cut and ſtitched, without any bad ſymptoms; and I have often ſeen them ulcerated and mortified, without any more ſign of pain than in other Parts: So that I cannot ſee what the great Miſchief of pricking this tendinous Faſcia is owing to, unleſs its lying ſo much upon the ſtretch, which may be wholly avoided by bending the elbow, and turning the cubit prone. Since I have conſidered this caſe, I have met with only one, which was thus injured by an injudicious blood-letter, who ordered the patient to keep her arm extended for fear of a contraction, and ſhe was not without the moſt violent pain for a whole fortnight; but upon bending the cubit, and turning the arm prone, ſhe grew preſently eaſy, and, in a few days, well. Neverthleſs, I am perſuaded that moſt of the accidents which are thought to be merely from blood-letting are critical diſcharges of ſome Diſeaſe, and from the puncture a ſmall inflammation beginning, encreaſes and ſuppurates: But however ſingular I may be thought in this opinion, I can be ſure I am diſintereſted in it, having never had any ill accident follow blood-letting in my life.

Tab. xii. 13. BRACHEUS INTERNUS, ariſes from below the middle of the Os Humeri, and is inſerted

into

into a rough place of the Ulna immediately below the juncture. This alſo bends the cubit.

SUPINATOR RADII LONGUS, ariſes from the lower and outer part of the Os Humeri, and is inſerted into the upper ſide of the Radius, near the Carpus. This muſcle is not a Supinator, but a bender of the cubit, and that with a longer lever than either of the two former muſcles, and is leſs concerned in turning the cubit ſupine, than either the extenſors of the Carpus, fingers or thumb.

TRICEPS EXTENSOR CUBITI, commonly diſtinguiſhed into Biceps and Bracheus Externus. The firſt of theſe heads ariſes from the lower Coſta of the Scapula near the Acetabulum; the ſecond from the outer and back-part of the Os Humeri; the third, lower and more internal; and are inſerted into the Proceſſus Olecranon of the Ulna. The firſt of theſe heads draws the arm backward, with as long a lever as it extends the cubit. Tab. xiii. 9.

ANCONEUS, ariſes from the outward extuberance of the Os Humeri, and is inſerted into the upper part of the Ulna: This is alſo an Extenſor. Tab. xiii. 10.

Muſcles of the Palm of the hand.

PALMARIS LONGUS, ariſes ſmall from the inner extuberance of the Os Humeri, and from a ſhort belly ſoon becomes a tendon, which is connected to the Ligamentum Tranſverſale Carpi, and expanded in the palm of

the hand. This muſcle is often wanting, but the expanſion in the hand never; yet it being connected to the ligament of the Carpus, it muſt bend the Carpus, and cannot conſtrict the palm of the hand; and when it is wanting the Flexor Carpi Radialis is larger.

PALMARIS BREVIS or CARO QUADRATA, ariſes obſcurely from the Ligamentum Tranſverſale Carpi, and ſeems to be inſerted into the eighth bone of the Carpus and the metacarpal bone of the little finger. This helps to conſtrict the palm of the hand, and is very different in ſize in different bodies.

Muſcles of the Carpus.

FLEXOR CARPI RADIALIS, ariſes from the inner extuberance of the Os Humeri, and ſoon becoming a ſtrong tendon, paſſes through a chanel of the fifth bone of the Carpus, and is inſerted into the metacarpal bone of the fore-finger; this not only bends the Carpus upon the Radius, but alſo the bones of the ſecond order upon thoſe of the firſt; which motion is nearly as much as that upon the Radius.

FLEXOR CARPI ULNARIS, ariſes from the ſame extuberance with the former, and a Faſcia betwixt this muſcle and the Tenſor Ulnaris, contiguous to the Ulna, and is inſerted by a ſhort tendon into the fourth bone of the Carpus.

EXTEN-

EXTENSORES CARPI RADIALES; the first arises from the Os Humeri immediately below the Supinator Radii Longus, and is inserted into the metacarpal bone of the first finger; the second arises immediately below this, from the outer extuberance of the Os Humeri, and is inserted into the metacarpal bone of the second finger. The first of these muscles is a bender of the cubit as well as an Extensor of the Carpus, and its often acting with the benders of the cubit while the other is not in action, is the reason why it is so distinct from it. Tab. xiii. 12.

EXTENSOR ULNARIS, arises from the same extuberance with the former, and half the Ulna below the Anconeus muscle; then becoming a tendon, runs in a small Sinus at the bottom of the Ulna, and is inserted into the metacarpal bone of the little finger. See Ulna. page 36. The extensors of the Carpus being inserted into the Metacarpus at once perform the motion between the bones of the Carpus, and that between the Carpus and Radius. The Flexor and Tensor Ulnaris acting together turn the hand downward, the Tensor and Flexor Radialis upward.

Muscles of the fingers.

PERFORATUS OR FLEXOR SECUNDI INTERNODII DIGITORUM, arises from the inner tubercle of the Os Humeri, and from the upper part of the Ulna, and the middle of the Radius;

Radius; then becoming four strong tendons, passes under the Ligamentum Transversale Carpi, and is inserted into the beginning of the second bone of each finger.

PERFORANS or FLEXOR TERTII INTERNODII DIGITORUM, arises from half the Ulna, and a great part of the ligament between the Ulna and Radius, then becoming four tendons, passes under the Ligamentum Transversale Carpi, and through the tendons of the former muscle to their insertion into the third bone of each finger. The tendons of both these muscles are tyed down to the fingers by a strong ligament. If these muscles had not passed one through the other, the Perforatus, which is the lesser muscle, must have gone to the last joint, where the stronger muscle is wanted; and besides, the tendons of the second joints would have pressed those that bend the last, and not lain firmly upon them neither.

LUMBRICALES or FLEXORES PRIMI INTERNODII DIGITORUM, arise from the tendons of the last mentioned muscle, and are inserted laterally toward the thumb into the beginning of the first bone of each finger.

Tab. xiii. 13. EXTENSOR DIGITORUM COMMUNIS, arises from the outer extuberance of the Os Humeri, and passing under a ligament, at the wrist, is divided into four tendons which communicate

municate upon the firſt joint, which keeps them from ſliding off the joints of the fingers, where they are a little connected to the firſt bones, and afterward are inſerted into the beginning of the ſecond bone of each finger.

Extensor Auriclaris or Minimi Digiti, is a portion of the laſt muſcle paſſing under the ligament in a diſtinct chanel.

Extensor Indicis, ariſes from the middle of the Ulna, and paſſing under the ligament of the Carpus, is inſerted with the Extenſor Communis into the fore-finger. This muſcle extends the fore-finger ſingly. I have twice ſeen it wanting.

Abductor Primi Digiti, Interossei and Abductor Minimi Digiti, are eight muſcles, one for each ſide of each finger. Abductor Primi Digiti, ariſes from the firſt bone of the thumb, and the ſide of the metacarpal bone of the firſt finger. The Interossei, are three pair fitly divided into external and internal; the external ariſe from the metacarpal bones, whoſe ſpaces they fill up next the back of the hand; the internal ariſe from the ſame bones in the inſide of the hand. Abductor Minimi Digiti, ariſes from the tranſverſe ligament, and fourth bone of the Carpus; theſe muſcles are inſerted, two into the firſt joint of each finger, and then paſſing obliquely over the tops of

of the fingers are inserted into their last bones; they bend the first joints, and extend the two last, as in holding a pen, and in playing upon some musical instruments. The Abductors of the fore and little fingers, with the second and fifth Interossei muscles acting, the fingers are divaricated, and the other four acting bring them together, and these muscles which divaricate the fingers, being extenders of the second and third joynts, we never can divaricate them without extending them a little.

Adductor Ossis Metacarpi Minimi Digiti, arises from the eighth bone and transverse ligament of the Carpus, and is inserted into the metacarpal bone of the little finger, which it pulls toward the thumb to constrict the palm of the hand.

Muscles of the thumb.

Extensor Primi Internodii Pollicis, arises from the Ulna below the Anconeus muscle, and the ligament between the Ulna and Radius; then becoming two, three, or four tendons is inserted into the fifth bone of the Carpus, and first of the thumb. The first of these Insertions can only assist the bending of the wrist upward, and in turning the arm supine.

Extensor Secundi Internodii Pollicis, arises immediately below the former from the Radius and transverse ligament, and is inserted by a few fibres into the

second

ſecond bone of the thumb, but chiefly into the third.

EXTENSOR TERTII INTERNODII POLLICIS, ariſes immediately below the laſt deſcribed, from the Ulna and ligament, and paſſes over the Radius nearer the Ulna to be inſerted at the third bone of the thumb: This extends the thumb more toward the Ulna than the former muſcle, and is very much a Supinator.

FLEXOR PRIMI & SECUNDI OSSIS POLLICIS, ariſes from the fifth bone and tranſverſe ligament of the Carpus, and from the beginnings of the two firſt metacarpal bones, and is inſerted into the whole length of the firſt bone of the thumb, and tendinous into the beginning of the ſecond; the ſeſamoid bones of the thumb, in ſuch bodies as have them, lie in this tendon, where it paſſes over the joint.

FLEXOR TERTII INTERNODII POLLICIS, ariſes large from almoſt all the upper part of the Radius, and becoming a round tendon paſſes under the Ligamentum Tranſverſale Carpi to be inſerted into the third bone of the thumb: This muſcle ſingly acting, draws the thumb towards the metacarpal bone of the little finger; but the laſt mentioned muſcle acting with it, turns it toward the fore-finger.

Adductor Pollicis, ariſes from the Carpus, and almoſt the whole length of the metacarpal bone of the long finger, and is inſerted into the beginning of the ſecond bone of the thumb. This muſcle naturally enough divides into two, and might better be called a Flexor than Adductor.

Abductor Pollicis, ariſes from the fifth bone and Ligamentum Tranſverſale of the Carpus, and is inſerted laterally in the beginning of the ſecond bone of the thumb to draw it toward the Radius.

The muſcles which bend the thumb are much leſs than thoſe which bend the fingers; nevertheleſs, the thumb is able to reſiſt all the fingers, merely from the advantages that ariſe from the thickneſs and ſhortneſs of the bones of the thumb, compared with thoſe of the fingers; but then the quickneſs of motion in the fingers will exceed that of the thumb, as much as the fingers exceed the thumb in length, and their muſcles thoſe of the thumb in largeneſs.

Muſcles of the Radius.

Supinator Radii Brevis, ariſes from the outer extuberance of the Os Humeri and upper part of the Ulna, and running half round the Radius, is inſerted near its tubercle.

Pronator Teres, ariſes from the inner Apophyſis of the Os Humeri, and upper and

and forepart of the Ulna, and is inſerted tendinous into the Radius below the former.

Pronator Quadratus, ariſes from the lower edge of the Ulna near the Carpus, and paſſing under the flexors of the fingers, is inſerted into the Radius.

These muſcles are occaſionally aſſiſted in their actions by the muſcles of the hand; moſt of the extenſors aſſiſting the ſupinators, and moſt of the flexors the pronators, and moſt of the extenſors of the hand take a great part of their origin from the tendinous Faſcia that covers them.

Mastoideus, ariſes tendinous from the Sternum near the Clavicula, and by a ſeparate fleſhy portion from the Clavicula, which ſoon unites with the other beginning, and is inſerted to the outer part of the mamillary proceſs of the temporal bone. It pulls that ſide of the head it is inſerted into towards the Sternum, and turns the face over the contrary ſhoulder. This with its fellow, pull the head and neck toward the breaſt, and act with a much longer lever upon each lower Vertebra, than they do upon the next above, and with more power upon any of thoſe bones than upon the head. This muſcle being inſerted into the head, beyond the center of motion of the head with the firſt Vertebra, has been ſuppoſed by Mr. Cowper, and others, to pull the head backward;

Muſcles of the head and neck. Tab.xii.2.

backward; but paſſing beyond ſignifies nothing to that purpoſe, unleſs a line paſſing through its Axis would paſs below the center of motion: And it is the more to be wondered how this miſtake prevailed, if we conſider that this muſcle's being added to the extenſors of the head and neck, would make the force of that action a hundred times greater than that of the benders. And if this is not enough to convince, let any one lying on his back raiſe his head, and he will ſoon feel this muſcle in action; but bowing the head forward in an erect poſture will not ſhew this, unleſs ſome reſiſtence is made to the head, becauſe the center of gravity of the head lying before the center of motion, there needs no more than a relaxation of the extenſors, to bring the head forward in that poſture.

Rectus Internus Major, ariſes from the anterior part of the tranſverſe proceſſes of the third, fourth, fifth and ſixth cervical Vertebræ; and paſſing over the two ſuperior, is inſerted into a roughneſs of the occipital bone near the fore-part of the great Foramen. This bends the head on the two firſt Vertebræ of the neck.

Rectus Minor Internus, ariſes under the laſt muſcle, from the firſt Vertebra, and is inſerted under it into the Os Occipitis. This bends the head on the firſt Vertebra.

Rectus

Rectus Lateralis, ariſes from the anterior part of the tranſverſe proceſs of the firſt Vertebra of the neck, and is inſerted into the Os Temporis and Occipitis between the mamillary and ſtyloid proceſſes. This turns the head to one ſide.

Splenius, ariſes by a thin tendon from the ſpinal proceſſes of the five ſuperior Vertebræ of the Thorax, and the loweſt of the neck, and Linea Alba Colli, and is inſerted into the Os Occipitis, the upper part of the Mamillary proceſs of the temporal bone, and the tranſverſe proceſſes of the three ſuperior cervical Vertebræ. This pulls the head and neck backward, and to the contrary ſide; but both of theſe acting together pull them directly backward.

Complexus, ariſes from the tranſverſe proceſſes of the ſix or ſeven ſuperior Vertebræ of the Thorax, and ſix inferior of the neck, and is inſerted into the Os Occipitis, and back-part of the Os Temporis; this laſt part is ſometimes diſtinct enough to be accounted another muſcle: It pulls the head and neck back.

Rectus Major Posticus, ariſes from the ſpinal proceſſes of the ſecond Vertebra of the neck, and is inſerted broader into the Os Occipitis. It pulls the head back on the two firſt Vertebræ.

Rectus Minor Posticus, arises from the back-part of the first Vertebra of the neck, (it having no spinal process) and is inserted below the former into the same bone to pull the head back on the first Vertebra.

Obliquus Superior, arises from the transverse process of the first Vertebra, and is inserted into the Os Occipitis and back-part of the Os Temporis near the Rectus Major; either of these acting, assist the Rectus Lateralis on the same side; but both together, pull the head back.

Obliquus Inferior, arises from the spinal process of the second Vertebra of the neck, and is inserted into the transverse process of the first. This, with its fellow, alternately acting, turn the head with the first Vertebra in a rotatory manner on the second, whose Processus Dentatus is the Axis of this motion.

Interspinales Colli, are three or four pair of muscles between the bifid processes of the cervical Vertebræ, which they draw nearer each other when the neck is bent backward.

Longus Colli, arises laterally from the bodies of the four superior Vertebræ of the Thorax, and from the anterior part of the transverse processes of the five inferior Vertebræ of the neck, and is inserted into the fore-

part

part of the firſt and ſecond Vertebræ of the neck, which it bends forward.

INTERTRANSVERSALES COLLI, are portions of fleſh between the tranſverſe proceſſes of the Vertebræ of the neck, like the Interſpinales, but not ſo diſtinct; they draw theſe proceſſes together.

SPINALIS COLLI, ariſes from the tranſverſe proceſſes of the five ſuperior Vertebræ of the back, and is inſerted into the ſpinal proceſſes of the ſecond, third, fourth and fifth Vertebræ of the neck. This pulls the neck backward.

TRANSVERSALIS COLLI, ariſes from the oblique proceſſes of the four inferior Vertebræ of the neck, and is inſerted into the ſpinal proceſs of the ſecond Vertebra of the neck. This muſcle is but a continuation of the Tranſverſalis or Semiſpinalis Dorſi.

THE muſcles of the head and neck are moſt of them obliquely directed, which makes them perform the oblique motions, as well as extenſion and flexion; which is highly convenient in this caſe, becauſe the joynts moved by theſe muſcles, being under the weight moved, it is neceſſary that the head ſhould be kept ſteady by the extenſors, and flexors too, when any great weight is upon the head; and theſe muſcles from the obliquity of their directions, not only perform theſe two actions at once, but act-

ing by pairs they move the head and neck ſteadily, in a diagonal direction, which ſtraight muſcles could not have done ſo well.

Muſcles of the Thorax.

SCALENUS ariſes from the tranſverſe proceſſes of the ſecond, third, fourth, fifth and ſixth cervical Vertebræ. It is inſerted in three parts, (being thus divided for the tranſmiſſion of the ſubclavian veſſels) into the two uppermoſt ribs. This muſcle may bend the neck, but its chief uſe is to ſupport its upper ribs, which is neceſſary to determine the contraction of the intercoſtal muſcles that way, and a ligament could not have done this, becauſe of the various poſitions that the neck and back are liable to.

SERRATUS SUPERIOR POSTICUS, ariſes with a thin tendon inſeparable from the Rhomboides, from the ſpinal proceſs of the inferior cervical Vertebra, and the three ſuperior of the Thorax, and is inſerted into the ſecond, third, and fourth ribs, immediately beyond their bendings; this, with the Scalenus, ſuſtains the upper ribs, that they might not be pull'd downward, by the depreſſors of the ribs in expiration, as the lower ribs are upward in inſpiration.

SERRATUS INFERIOR POSTICUS, ariſes with a broad tendon (inſeparable from that of the Latiſſimus Dorſi) from the ſpinal proceſſes of the three ſuperior Vertebræ of the

loyns

loyns, and two inferior of the Thorax, and is inſerted into the tenth rib, but chiefly the ninth and eleventh. It pulls down the ribs in exſpiration.

INTERCOSTALES, are eleven pair on each ſide, in the interſtices of the ribs; from their ſituations diſtinguiſhed into external and internal; they all ariſe from the under edge of each rib, and are inſerted into the upper edge of the rib below. The external are largeſt backward, having their firſt beginnings from the tranſverſe proceſſes of the Vertebræ like diſtinct muſcles, which ſome call Levatores Coſtarum. The internal run all from above obliquely backward; being thickeſt forward, and thinneſt toward the ſpine. Theſe are alſo continued betwixt the cartilages of the Sternum, with fibres perpendicular to the Cartilages; and between the cartilages of the loweſt ribs, they are inſeparable from the Obliquus Aſcendens Abdominis. Theſe muſcles by drawing the ribs nearer to each other, pull them all upward, (they being ſuſtained at the top by the Scalenus and Serratus Superior Poſticus) and dilate the Thorax. To theſe Mr. Cowper adds ſome fleſhy fibres, which run from one rib over a ſecond to a third, near the ſpine, which are Levatores Coſtarum.

TRIANGULARIS STERNI, ariſes internally from the Cartilago Enſiformis, and the

lower edge of the Os Pectoris, and is inſerted into the end of the third, fourth, fifth and ſixth ribs. This pulls the ribs to the bone of the Sternum, and thereby bends its cartilages in exſpiration.

Diaphragma, ariſes on the right ſide by a proceſs from three lumbal Vertebræ, and one of the Thorax; and on the left, from the one ſuperior of the loyns, and inferior of the Thorax; (this laſt part being leſs to give way to the great artery) and is inſerted into the lower part of the Sternum and the five inferior ribs. The middle of this muſcle is a flat tendon, from whence the fleſhy fibres begin, and are diſtributed, like Radii, from a center to a circumference. When this muſcle acts alone, it conſtricts the Thorax, and pulls the ribs downward, and approaches toward a plain; which action is generally performed to promote the ejection of the Fæces. In large inſpirations, when the intercoſtals lift up the ribs to widen the Thorax, this muſcle acts enough to bring it ſelf toward a plain without overcoming the force of the intercoſtals; by which means the breaſt is at once widened and lengthened: When it acts with the abdominal muſcles it draws the ribs nearer together, and conſtricts the Thorax, and the ſuperior force of the abdominal muſcles thruſting the parts of the lower belly againſt it, it becomes

at

at the ſame time convex upward, and ſhortens the Thorax, which occaſions the largeſt exſpirations; or acting alternately with the abdominal muſcles only, a more moderate inſpiration and exſpiration is made by ſhortening and lengthening the Thorax only, which is what we chiefly do when lying down; or acting alternately with the intercoſtals only, a moderate exſpiration and inſpiration is cauſed by the widening and narrowing the breaſt, which is what we are moſt prone to in an erect poſition, the muſcles of the Abdomen, at ſuch times, being employed in ſupporting the parts contained in the Abdomen. And though theſe motions of the ribs require at any one time but very little force, the air within the Thorax balancing that without; yet that theſe muſcles whoſe motions are eſſential to life may be never weary, the inſpirators in moſt men have force ſufficient to raiſe mercury in a tube four or five and twenty inches, in an erect poſture, and the exſpirators ſix or ſeven; the firſt of which will require about four thouſand pound force in moſt men, and the other proportional. But I imagine, that lying down, theſe proportions will differ by the weight of the parts contained in the Abdomen. In all the bodies I have diſſected, I have found the diaphragm convex upward, which gave me occaſion to think, that all animals died in exſpiration, till the forementioned experiment

 diſcovered,

diſcovered, that the muſcles of inſpiration were ſtronger than thoſe of exſpiration; which led me to make the following experiment. I cut the wind-pipe of a dog, and having a ſtring ready fixed, I put a cork into it, and tyed it faſt inſtantly after inſpiration; upon which I obſerved, that the diaphragm, and the other muſcles of inſpiration and exſpiration were alternately contracted, and diſtended for ſome time; but when he was dead, the abdominal muſcles were in a ſtate of contraction, the ribs were elevated to dilate the Thorax, and the diaphragm was convex upward; this experiment alſo ſhews, that the diaphragm is not a muſcle of equal force either to the depreſſors or elevators of the ribs, it neither hindering the elevators from raiſing the breaſt; nor the depreſſors from thruſting it upward, by compreſſing the parts contained in the Abdomen, though the breaſt was full of air.

Muſcles of the loins, back and neck.

SACER SACROLUMBALIS, LONGISSIMUS DORSI, and SEMISPINALIS, are all that portion of fleſh betwixt the Os Sacrum and the neck, which, ſeeing there is no membrane to diſtinguiſh it into ſeveral muſcles, and that it is all employed in the ſame actions, I ſhall give it the name of Extenſor Dorſi & Lumborum, and deſcribe it all as one muſcle.

EXTENSOR DORSI & LUMBORUM, ariſes from the upper part of the Os Sacrum, the

the ſpine of the Os Ilium, the back-parts of the lowermoſt Vertebræ of the loins, and remarkably from thoſe ſtrong tendons which appear on their outſides. That part of this muſcle which is known by the name of Sacrolumbalis is inſerted into all the ribs near their articulations, with the tranſverſe proceſſes of the Vertebræ, and into the tranſverſe proceſs of the laſt Vertebra of the neck; beſides, as this paſſes over the ribs, it receives an origin from every rib, in a manner that cannot well be deſcribed: The portions of this muſcle which ariſe from the ribs, and are inſerted into other ribs above will neceſſarily draw the back-part of the ribs nearer together, which muſt always be done as the back extends, and independent of other actions of the Thorax. The next portion of this muſcle, called Longiſſimus Dorſi, is inſerted into all the tranſverſe proceſſes of the Vertebræ of the back, and partly into the ribs, and the uppermoſt tranſverſe proceſſes of the Vertebræ of the loins; and the upper end of it is neither very diſtinct from the Complexus of the head, nor Spinalis of the neck. The reſt of this muſcle, known by the names of Semiſpinalis, Sacer, &c. ariſes alſo from all the tranſverſe and oblique proceſſes of the loins and back; every portion, except the lowermoſt, paſſing over five joints, is inſerted into the ſpinal proceſs of the ſixth Vertebra above its origin,

origin, all the way up the back, and at the neck commences Tranſverſalis Colli: This paſſing of each portion of a muſcle over a few joints, diſtributes their force equally enough among all theſe joints, without the fibres being directed more obliquely than thoſe of penniform muſcles; but the neck and loins not having ſufficient proviſion of this ſort, there are ſmall muſcles between their proceſſes, which though they are of little importance for the motions of thoſe parts, yet are ſufficient to diſtribute the force of larger muſcles equally among thoſe joints; and beſides the uſes of the Extenſor Dorſi & Lumborum, which its name implies, it, and its fellow, alternately raiſe the hips in walking, which any one may feel by laying his hand upon his back.

Muſcles of the loins.

Quadratus Lumborum, ariſes from the upper part of the ſpine of the Ilium, and is inſerted into all the tranſverſe proceſſes of the four uppermoſt lumbal Vertebræ. This, with its fellow, acting alternately, aſſiſt the laſt mentioned muſcle in raiſing the Oſſa Innominata in progreſſion: Or each acting ſingly, while the lower limbs are not moved, inclines the body to one ſide.

Intertransversales Lumborum, are ſmall muſcles ſeated between all the tranſverſe proceſſes of the Vertebræ Lumborum, to bring them nearer together.

Psoas

Psoas Parvus, arises laterally from the body of the first lumbal Vertebra, and the lowest of the back, and soon becoming a small tendon, is inserted into the Os Pubis near the Ilium. It either assists in bending the loins forward, or raising the Os Innominatum in progressive motions. This muscle is often wanting.

Psoas Magnus, arises laterally from the bodies and transverse processes of the four superior Vertebræ of the loins, and the last of the back, and is inserted with the following muscle into the lesser Trochanter. This bends the thigh, and when the Psoas Parvus is wanting this is larger. Muscles of the thigh.

Iliacus Internus, arises from the concave part of the Ilium, and from its lower edge, and passing over the Ilium near the Os Pubis, joins the former muscle, and is inserted with it, to be employed in the same action.

Pectineus, arises from the Os Pubis or Pectinis, near the joining of that bone with its fellow, and is inserted into the Linea Aspera of the thigh-bone, four fingers breadth below the lesser Trochanter. This bends the thigh and turns the toes outward.

Triceps Femoris, the two lesser heads of this muscle arise under the Pectineus, and the third from the inferior edges and back-part of the Os Pubis and Ischium, and is inserted into

into the whole length of the Linea Afpera and the inner Apophyfis of the Os Femoris. This alfo bends the thigh and turns the toes outward. When the thigh-bone is moved in a plain, which cuts at right angles a plain that paffes through the Axis of either head of the laft mufcle, that head rifing lower than the center of motion of the hip-joint, it will equally affift both the flexors and extenfors, and that moft when the bone has been moved moft backward or forward; and as either of thefe heads lie more or lefs out of the faid plain, they will give greater affiftance to that motion which is made on the fide of the faid plain, contrary to their Situation, and lefs on the fame fide. This mechanifm is frequently made ufe of to make one mufcle ferve different actions; but I have only explained it in this inftance, becaufe it is the moft confiderable one that I know.

Gluteus Maximus, arifes from the back-part of the fpine of the Ilium, and the Dorfum Ilii, and fide of the Os Coccygis and Sacrum, and a ligament extended between thefe bones, and from a thin Fafcia fpread over that part of the following mufcle, which this does not cover, and is inferted by a ftrong tendon into the upper part of the Linea Afpera of the thigh-bone, and alfo into the flat tendon of the Fafcialis mufcle, which infertion into, or connection with, that tendon raifes this mufcle farther

ther from the center of motion and encreases its strength. This extends the thigh, and both these together being contracted, occasionally assist the Levatores Ani in supporting the Anus. The breadth of the origin and insertion of this Muscle, is very observable, for by that means, though it is the largest muscle in the body, it is nevertheless right-lined without one fibre compressing another any more than in penniform muscles.

GLUTEUS MEDIUS, arises from all the anterior part of the Spina and Dorsum Ilii, and under part of the last mentioned muscle, and is inserted into the upper part of the great Trochanter of the thigh-bone. This extends the thigh outward.

GLUTEUS MINIMUS, arises entirely under the former, from the Dorsum Ilii, and is inserted into the upper and anterior part of the great Trochanter and neck of the thigh-bone to extend the thigh.

PYRIFORMIS, arises internally from the inside of the Os Sacrum, and growing in more than half its progress into a round tendon, is inserted into the upper part of the sinus at the root of the great Trochanter. This assists somewhat in extending the thigh, but more in turning it outward.

QUADRATUS FEMORIS, arises from the obtuse process of the Ischium, and is inserted

into the upper part of the Linea Aſpera of the thigh-bone, between the two Trochanters. This draws the thigh inward, and directs the toes outward.

Obturator Internus, or Marsupialis, ariſes generally from a ſtrong membrane or ligament, which fills up the hole of the Os Innominatum, and from the circumambient bone; thence paſſing over a chanel in the Iſchium betwixt its two proceſſes, it receives from them two other portions, which are a ſort of Marſupium; and is inſerted into the Sinus of the great Trochanter. This turns the thigh outward.

Obturator Externus, ariſes oppoſite to the former, from the outſide of the Os Innominatum, and is inſerted into the Sinus of the great Trochanter. This alſo turns the thigh outward These four laſt mentioned muſcles acting with the extenſors, prevent their turning the toes inward, and in ſtepping forwards are continually acting to turn the toes outwards; for though the toes are placed perpendicular to the front of the body, in taking a long ſtep, theſe muſcles bring them perpendicular to the ſide of the body; and as theſe direct, the ſame extenſors will turn the thigh either outward or backward, with their full force.

Muſcles of the Tibia.

Fascialis or Membranosus, ariſes from the forepart of the ſpine of the Ilium, and in

in about five inches progreſs becomes a flat tendon or Faſcia, which is joined by a conſiderable detachment from the tendon of the Gluteus Maximus, and from the Linea Aſpera of the thigh-bone, and then covering in an eſpecial manner the Vaſtus Externus is inſerted at the top of the Tibia and Fibula, and then proceeds to join the Faſcia, which covers the upper part of the muſcles ſituate on the outſide of the Tibia, and from which a great part of the fibres of thoſe muſcles ariſe. About the middle of the leg it grows looſe, and is ſo continued to the top of the foot, being connected there and at the lower part of the leg, to the ligaments which tie down the tendons; this tendon, where it covers the Vaſtus Externus, receives additional tranſverſe fibres, which run round the thigh, but are moſt conſpicuous on the outſide. This draws the thigh outward, and paſſing over the knee forwarder than its Axis of motion, it will help to extend that joint.

Gracilis, ariſes from the Os Pubis cloſe to the Penis, and is inſerted into the Tibia four or five fingers breadth below the knee. This draws the thigh inward, and paſſing over the knee behind its Axis of motion, it will help to bend it.

Sartorius, ariſes from the fore-part of the ſpine of the Ilium, and thence deſcending obliquely to the inſide of the Tibia is there inſerted

inſerted four or five fingers breadth below the joint. This at once helps to bend both the thigh and leg, (particularly the thigh) at very long levers; it directly helps to lift up the leg in walking up ſtairs, or laying the legs acroſs like taylors.

SEMITENDINOSUS, ariſes from the obtuſe proceſs of the Iſchium, and growing a round tendon in ſomewhat more than half its progreſs, is inſerted near the former muſcles into the Tibia; it helps to extend the thigh and bend the Tibia.

SEMIMEMBRANOSUS, ariſes by a flat tendon like a membrane from the obtuſe proceſs of the Iſchium, and being continued tendinous betwixt the bellies of the laſt mentioned and following muſcles, and then growing fleſhy, becomes again tendinous above the joint, and is inſerted nearer the joint than the former muſcle for the ſame uſe.

THESE two make the internal hamſtring, and ariſing and inſerting ſo near together, they might have been one muſcle, but their fibres would have been near twice as long, which would have given a motion near twice as quick, but not ſo ſtrong, unleſs it had been inſerted at a diſtance from the joint it moves proportionable to its length, which could not well be, therefore they are made two muſcles of a number of fibres nearly equal to what one could

could have been, and are inserted at distances from the Axis of motion of the knee, proportional to the different lengths of their fibres in the directions of their Axes.

Biceps Tibiæ, the first head arises in common with the two preceding muscles, from the obtuse process of the Ischium; the second from the lower part of the Linea Aspera of the thigh-bone; this soon joins the former, and is inserted with it into the upper part of the the Fibula to bend the leg, and the first head also extends the thigh. The tendon of this muscle makes the external hamstring, when the knee is bent, as when we sit down, the Biceps will turn the leg and toes outward, and the Semitendinosus and Semimembranosus will turn them inward.

Popliteus, arises from the outer Apophysis of the Os Femoris, and thence running obliquely inward, is inserted into the Tibia immediately below its head. This assists the flexors, and draws the Tibia toward the outer Apophysis of the thigh-bone.

Rectus Tibiæ, arises with a tendon from the upper part of the Acetabulum of the Os Innominatum, and by another tendon (which is a sort of ligament to this) from a Processus Innominatus of the Illium below its spine forward, and is inserted together with the three

following muscles into the Patella. It bends the thigh, and extends the Tibia.

Vastus Externus, arises from the anterior part of the great Trochanter and upper part of the Linea Aspera of the thigh-bone, and is inserted into the upper and external part of the Patella. It extends the Tibia.

Vastus Internus, arises from the inner and lower part of the Linea Aspera, and is inserted into the upper and inner part of the Patella, to extend the Tibia; and the fibres of this muscle being oblique, it keeps the Patella in its place, the other muscles lying in the direction of the Os Femoris, which makes an obtuse angle with the Tibia, they would alone be liable to draw the Patella outward. This contrivance is most obvious in those whose knees bend most inward.

Crureus, arises between the two last below the Rectus, from all the convex part of the Os Femoris, and is inserted in like manner into the Patella; the Patella being tied down by a strong ligament to the Tibia. These three last muscles extend the Tibia only, and might very properly be called, Extensor Tibiæ Triceps.

When the Patella is so broke transverse that the part into which the muscles are inserted is distinctly separated from that by which the ligament is fixed, the fracture can never be well cured,

cured, because the muscles will keep the parts asunder; but when the fracture is otherwise it admits of a better cure.

Muscles of the Tarsus.

GASTEROCNEMIUS, arises by two small beginnings above the back-part of the Apophyses of the Os Femoris, which soon becoming large bellies unite, and then become a flat tendon which joins the following muscles to be inserted into the Os Calcis. The two parts of this muscle, are by some writers distinguished into two muscles. Its use is to extend the Tarsus and bend the knee.

PLANTARIS, arises under the outer beginning of the last named muscle, from the external Apophysis of the Os Femoris, and soon becoming a small tendon, is so continued betwixt the foregoing and subsequent muscles, and is inserted with them. It bends the knee and extends the Tarsus. Authors derive the tendinous expansion on the bottom of the foot from the tendon of this muscle; but seeing the expansion is much more than this tendon could make, and that this tendon can be traced no farther than the Os Calcis, and that the expansion is as large when the muscle is wanting, which is not seldom, I cannot be of that opinion.

GASTEROCNEMIUS INTERNUS, arises from the upper part of the Tibia, and one third of the Fibula below the Popliteus, and is

inſerted with the two foregoing muſcles by a ſtrong tendon into the upper and back-part of the Os Calcis. This muſcle only extends the Tarſus.

TIBIALIS ANTICUS, ariſes from the upper and exterior part of the Tibia, and is inſerted laterally into the Os Cuneiforme Majus of the Tarſus, and by a ſmall portion of its tendon into the metacarpal bone of the great toe. This bends and turns the Tarſus inward.

TIBIALIS POSTICUS, ariſes firſt by a ſmall beginning from the upper part of the Tibia between that bone and the Fibula, then paſſing between the bones through a perforation in the tranſverſe ligament which connects thoſe bones, it takes other beginnings from the upper and middle part of the Tibia, and from the middle of the Fibula, and the ligament betwixt the Tibia and Fibula; then growing a round tendon, paſſes under the inner ancle, and is inſerted into the lower part of the Os Naviculare, and into the Os Cuneiforme Majus. This extends and turns inward the Tarſus.

PERONEUS LONGUS, ariſes from the upper and outer part of the Fibula, and growing a tendon toward the lower part of this bone, paſſes under the outer ancle, and the muſcles ſituated on the bottom of the foot, and is inſerted into the beginning of the metatarſal bone of the great toe, and the Os Cuneiforme

next

next that bone. This turns the Tarsus outward, and directs the force of the other extensors of the Tarsus toward the ball of the great toe.

PERONEUS BREVIS, arises from the middle of the Fibula, under a part of the former, and growing tendinous, passes under the outer ancle, and is inserted into the beginning of the upper part of the Os Metatarsi of the little toe, and sometimes bestows a small tendon on the little toe. Its use is to extend the Tarsus, and turn it outward.

THESE two last muscles riding over the lower end of the Fibula, are often the cause of a sprain in the outer ancle, when they are vehemently exerted, to save a fall.

Muscles of the great toe.

EXTENSOR POLLICIS LONGUS, arises from the upper and middle part of the Fibula and Ligamentum Transversale, and soon becoming a strong tendon, is inserted into the last bone of the great toe. This also bends the Tarsus with a much longer lever than it extends the toe.

EXTENSOR POLLICIS BREVIS, arises from the fore-part of the Os Calcis, and is inserted into the same place with the former.

FLEXOR POLLICIS LONGUS, arises from the Fibula, opposite to the Extensor Longus, and then passing under the inner ancle, is inserted to the under side of the last bone of the

great toe. This extends the Tarſus at a longer lever than it bends the toe.

FLEXOR BREVIS, and ADDUCTOR POLLICIS, are the ſame muſcle, ariſing from the two leſſer Oſſa Cuneiformia and Os Cuboides, and Calcis; they are inſerted into the Oſſa Seſamoidea, which are tied by a ligament to the firſt bone of the great toe, reckoning only two bones to the great toe. Theſe muſcles bend the great toe.

ABDUCTOR POLLICIS, ariſes pretty large from the inner and back-part of the Os Calcis, and by a ſmaller beginning from the Os Naviculare; thence paſſing forward contiguous to the Os Cuneiforme Majus, paſſes by the external ſeſamoid bone of the great toe to its inſertion into the firſt bone of the great toe. This muſcle is leſs an Abductor than a Flexor Pollicis Pedis; it alſo very much helps to conſtrict the foot length-ways.

TRANSVERSLIS, PEDIS, ariſes from the lower end of the metatarſal bone of the toe next the leaſt, and is inſerted into the internal ſeſamoid bone. This is truly an Adductor of the great toe, and helps to keep the conſtricture of the bottom of the foot.

Muſcles of the leſſer toes.

EXTENSOR DIGITORUM PEDIS LONGUS, ariſes acute from the upper part of the Tibia, and from the upper and middle part of the Fibula and ligament between theſe bones; then

then dividing into five tendons, four of them are inserted into the second bone of each lesser toe, and the fifth into the beginning of the metatarsal bone of the least toe, and sometimes by a small tendon also into the little toe. This last portion, for the most part is separate, from its beginning, and may be accounted a distinct muscle. The four first tendons only of this muscle extend the toes, but all five bend the Tarsus, and that with a longer lever than any of them bend a toe.

Extensor Digitorum Brevis, arises together with the Extensor Pollicis Brevis from the Os Calcis, and dividing into three small tendons is inserted into the second joint the three toes next the great one. The long extensors of the toes serve not only to extend them, but also contribute to the bending of the ancle, which motions are usually performed together in progression; but the short extensors arising below the ancle, extend the toes only; and when the long extensors are employed for that action only, the extensors of the Tarsus must act at the same time, to prevent the bending of the ancle; this is the reason why the toes have need, though their motions are less, of more extensors than the fingers.

Flexor Brevis or Perforatus, arises from the under and back-part of the Os Calcis, thence passing toward the four lesser

toes, divides into four tendons, which are inſerted into the beginning of the ſecond bone of each of the leſſer toes. Theſe tendons are divided to let through the tendons of the following muſcle.

FLEXOR LONGUS or PERFORANS, ariſes from the back-part of the Tibia, above the inſertion of the Popliteus, and part of the Fibula; thence deſcending under the Os Calcis to the bottom of the foot becomes tendinous, which part croſſes, and, in moſt bodies, communicates with the Flexor Longus Pollicis Pedis; then it divides into four tendons, which paſs through thoſe of the Flexor Brevis are inſerted into the third bone of each of the four leſſer toes. This muſcle alſo extends the Tarſus. The ſecond beginning of this muſcle ariſes from the Os Calcis, and joins the tendons where they divide. This portion only bends the toes; and ſeeing the Flexor Longus of the toes will, when it acts alone, extend the Tarſus as well as bend the toes, this portion (like the ſhort extenſors of the toes) ſeems purpoſely contrived to bend the toes alone.

LUMBRICALES, ariſe from the tendons of the Perforans, and are inſerted into the firſt bone of each of the leſſer toes, which they bend.

ABDUCTOR MINIMI DIGITI PEDIS, ariſes by the Perforatus from the Os Calcis, and being part of it inſerted into the metacarpal

pal bone of the leaſt toe, it receives another beginning from the Os Cuboides, and is inſerted into the firſt bone of the leaſt toe, which it bends and pulls outward, and very much helps to conſtrict the bottom of the foot.

ABDUCTOR SECUNDUS MINIMI DIGITI, this ariſes under the former muſcle from the metatarſal bone, and is inſerted into the little toe.

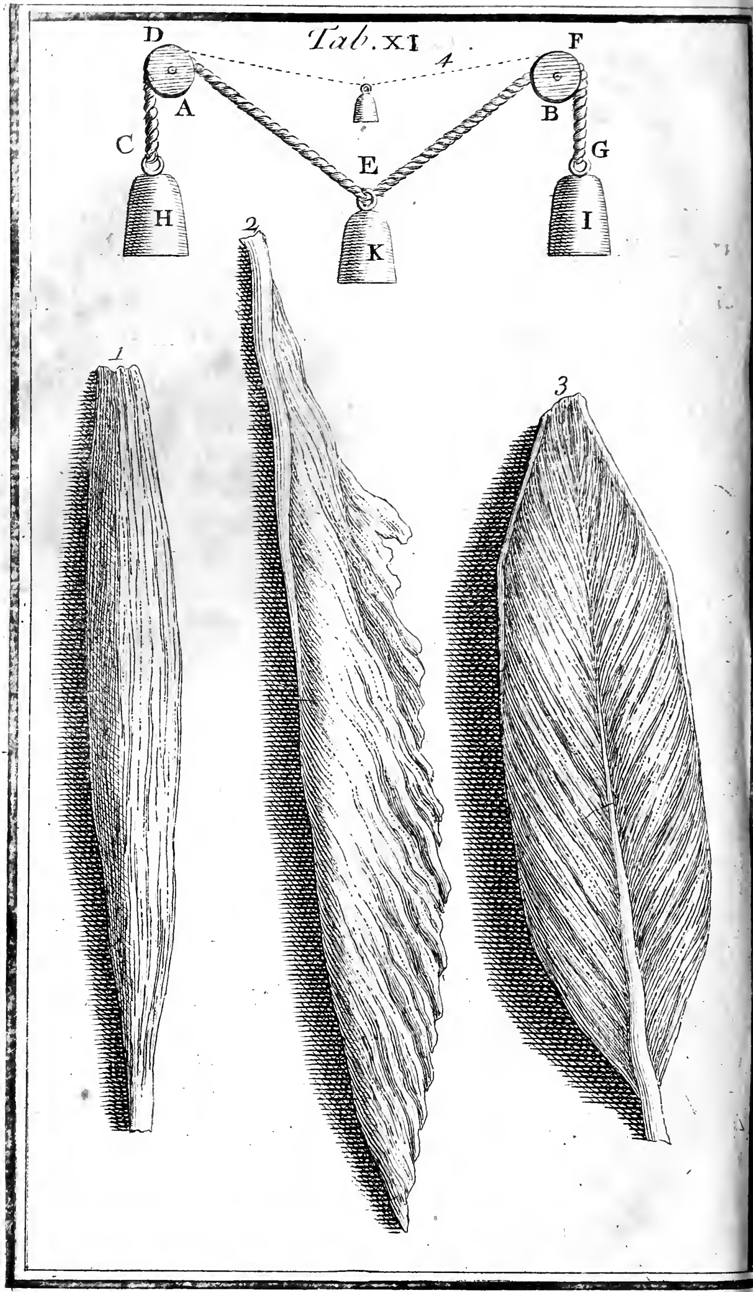
INTEROSSEI, are ſeven muſcles which lie like thoſe of the hands, and ariſe like them from the metatarſal bones, and are inſerted like them into the laſt joints of the four leſſer toes, and being in their progreſs attached to the tendons which extend the ſecond joints of the toes, they will extend both theſe joints. Theſe muſcles may be fitly divided into external and internal, the internal alſo bend the firſt joints, as do all the Interoſſei in the hand, but here the outer ones extend the firſt joints; and if we conſider that the firſt of theſe muſcles is analagous to the Abductor Indicis of the hand, and that the Abductor Minimi is alike in both, we find that the muſcles to move the fingers and leſſer toes ſideways are alike in number, though this motion of the toes is in a manner loſt from the uſe of ſhoes. The muſcles that bend or extend the laſt joints of the toes will alſo move the ſecond and firſt, and thoſe that move the ſecond will alſo move the firſt. The ſame re-

 mark

mark ſhould have been made about the muſcles of the fingers.

THOUGH a great many authors have thought it worth while to contend in many inſtances which ſhall be called the origin, and which the inſertion of ſome muſcles, whoſe ends have been both liable to be moved, yet none of them have conſidered, that every extenſor of the thigh, Tibia, and Tarſus, has always had that end which is moſt moved called its origin, and the other its inſertion; contrary to the rule which all have laid down to judge by.

THE number of the muſcles cannot be adjuſted, becauſe anatomiſts are neither agreed about ſome of them, whether they ſhould be counted muſcles or not, nor of others how far they ſhall be divided; though in the main, they ſeem to think him the beſt anatomiſt who divides them moſt; for my own part, I am not for dividing them as far as they can be divided, but as far as is neceſſary to the knowledge of their uſes.



G. V.dr Gucht Sculp.

TABLE XI.

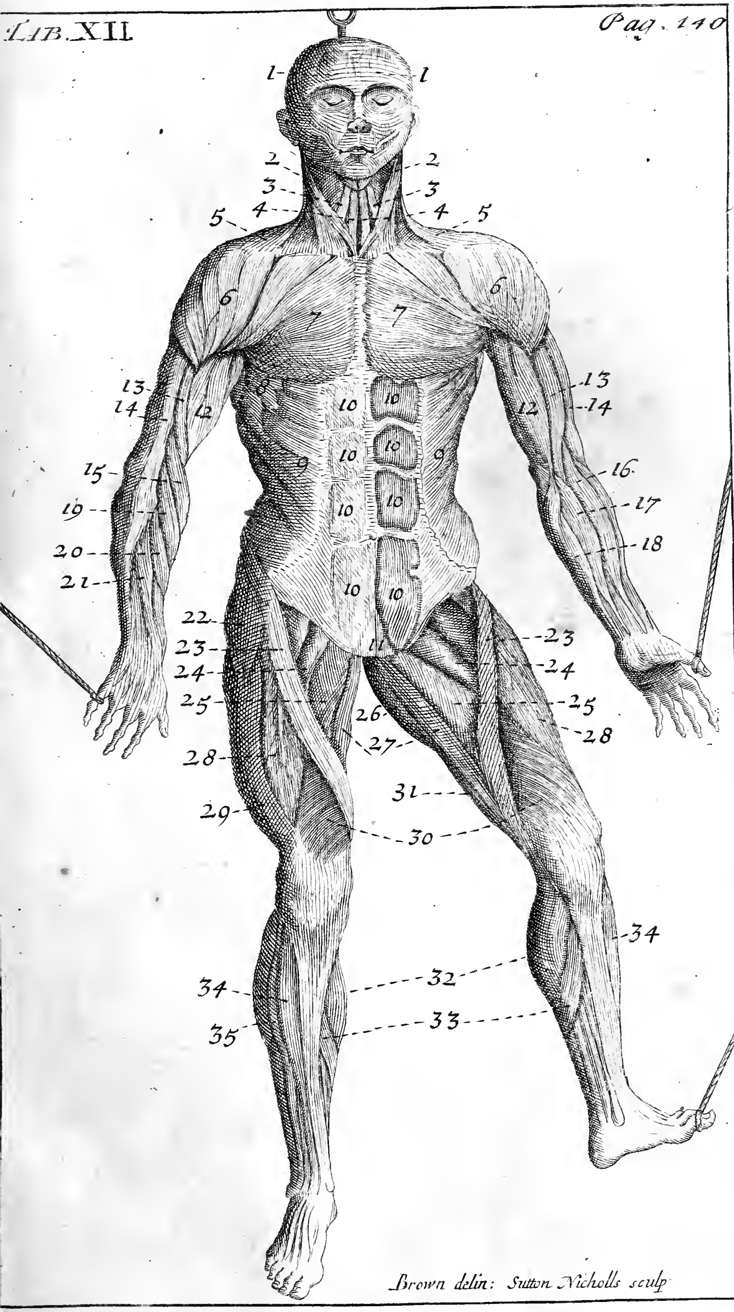
Figure 1. A rectilineal muſcle.
Fig. 2. A ſingle penniform muſcle.
Fig. 3. A double penniform muſcle.
Fig. 4. Is a ſcheme to explain the different properties of rectilineal and penniform muſcles.

A B, are two pullies, about which the chord C D E F G is inflected. H I, are two equal weights, hung in a perpendicular direction at each end of this chord. K, is another weight hung at E, the middle of that part of the chord which lies between the pullies. When the weight K, and the weights H I balance each other, the coſine of half the angle D E F, bears the ſame proportion to the Radius, as the weight K bears to the ſum of the weights H and I: So that the weight K, muſt never be ſo great as the ſum of the weights H I; and the leſs the weight K is, the greater will be the angle D E F, when the weights are in Equilibrio. Beſides, if the weight K be raiſed directly upwards, the velocity wherewith the weight K is made to aſcend, will be to the velocity wherewith each of the weights H I will deſcend, as the Radius to the coſine of half the angle D E F.

TABLE

TABLE XII.

1. Frontalis.
2. Maſtoideus.
3. Coracohyoideus.
4. Sternohyoideus.
5. A ſmall part of the Trapezius.
6. Deltoides.
7. Pectoralis.
8. Part of the Serratus Major Anticus.
9. Obliquus Deſcendens Abdominis.
10. The portions of the Recti, the left being diveſted of its Faſcia.
11. Pyramidales.
12. Biceps Cubiti Flexor.
13. Bracheus Flexor.
14. Triceps Extenſor Cubiti.
15, 16. Supinator Radii Longus.
17. Flexor Carpi Radialis.
18. Flexor Carpi Ulnaris.
19. The firſt head of the Extenſor Carpi Radialis.
20. The ſecond head of the ſame muſcle.
21. Extenſor Digitorum Communis.
22. Faſcialis or Membranoſus.
23. Sartorius.
24. One head of the Triceps.
25. Pectineus.
26. The great head of the Triceps.



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27. Gracilis.
28. Rectus.
29. Vaſtus Externus.
30. Vaſtus Internus.
31. Semitendinoſus.
32. Gaſterocnemeus Externus.
33. Soleus, or Gaſterocnemeus Internus.
34. Tibialis Anticus.
35. Tenſor Pollicis Pedis Longus.

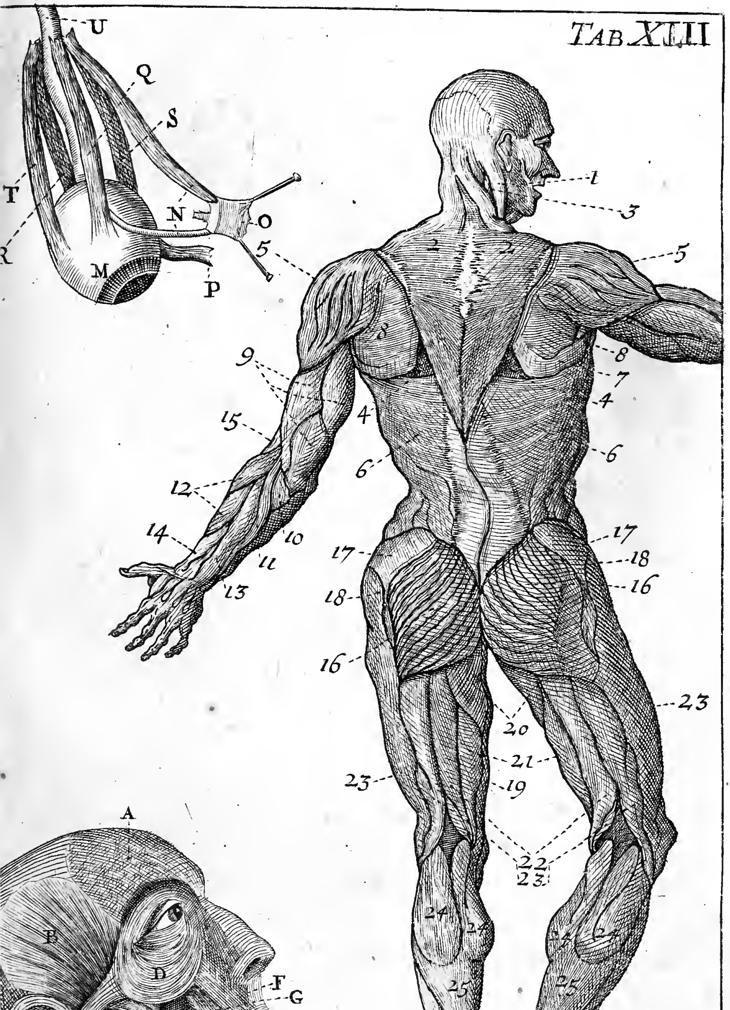
TABLE XIII.

Muſcles of the face.

A, Frontalis.
B, Temporalis.
C, Maſſeter.
D, Orbicularis.
E, Sphincter Oris.
F, Elevator Labii Superioris Proprius.
G, Elevator Labiorum Communis.
H, Depreſſor Labiorum Communis.
I, Depreſſor Labii Inferioris Proprius.
K, Zygomaticus.
L, Buccinator.
M, *The right eye with its muſcles.*
N, Obliquus Superior.
O, The Trochlea through which it paſſes.
P, Obliquus Inferior.
Q, Elevator Occuli.
R, Depreſſor Occuli.
S, Adductor Occuli.
T, Abductor Occuli.
U, The optick nerve.

A view

TAB XIII



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A view of the poſterior external muſcles.

1. Maſtoideus.
2. Trapezius.
3. A very ſmall part of the Elevator Scapulæ.
4. A very ſmall part of the Rhomboides.
5. Deltoides.
6. Latiſſimus Dorſi.
7. Teres Major.
8. Infraſpinalis Scapulæ.
9. Triceps extenſor Cubiti.
10. Anconeus.
11. Extenſor Carpi Ulnaris.
12. Extenſor Carpi Radialis.
13. Extenſor Digitorum Communis.
14. Extenſor Primi Internodii Pollicis.
15. A very ſmall part of the Supinator Radii Longus.
16. Gluteus Maximus.
17. Gluteus Medius.
18. Membranoſus or Faſcialis.
19. Gracilis.
20. The great head of the Triceps.
21. Semimembranoſus.
22. Semitendinoſus.
23. Biceps Tibiæ.
24. Vaſtus Externus.
25. Gaſterocnemeus Externus.
26. Soleus, or Gaſterocnemeus Internus.

BOOK III.

CHAP. I.

Of the external parts, and common integuments.

THE vulgar names of the external parts of the human body being ſufficiently known for the deſcription of any diſeaſe or operation; I ſhall only deſcribe thoſe which anatomiſts have given for the better underſtanding of the ſub-contained parts.

The hollow on the middle of the Thorax, under the breaſts, is called Scrobiculus Cordis. The middle of the Abdomen for about three fingers breadth above and below the navel, is called Regio Umbilicalis. The middle part above this, Epigaſtrium. On each ſide of the Epigaſtrium, under the cartilages of the lower ribs, Hypochondrium; and from below the Regio Umbilicalis down to the Oſſa Ilia, and Oſſa Pubis, Hypogaſtrium.

Cuticula or Scarf-Skin, is that thin inſenſible membrane which is raiſed by bliſters in living bodies: It is extended over every part of the true ſkin, unleſs where the nails are. It appears to me in a microſcope a very fine ſmooth membrane, only unequal where the Reticulum Mucoſum adheres to it. Lewenhoeck and others, ſay, it appears ſcaly, and compute that a grain of ſand of the hundredth part of an inch diameter, will cover two hundred and fifty of theſe ſcales, and that each ſcale has about five hundred pores; ſo that according to them, a grain of ſand will cover 125000 pores, through which we perſpire. Its uſe is to defend the true ſkin that it may not be expoſed to pain from whatever it touches; and alſo to preſerve it from wearing: It is thickeſt on thoſe parts of the bottom of the foot which ſuſtain the body; and in hands much uſed to labour, being ſo contrived as to grow the thicker, the more thoſe parts are uſed.

Between this and the true ſkin, is a ſmall quantity of ſlimy matter, which was ſuppoſed, by Malpighi, and others, to be contained in proper veſſels, interwoven with one another, and therefore by them named Reticulum Mucoſum. It is moſt conſiderable where the Cuticula is thickeſt, and is black, white, or duſky, ſuch as is the complexion; the colour of this, and the Cuticula, being the only difference be-

tween

tween Europeans, and Africans or Indians, the fibres of the true ſkin being white in all men; but the florid colour of the cheeks, is owing to the blood in the minute veſſels of the ſkin, as that in the lips to the veſſels in the muſcular fleſh; for the Cuticula (as I imagine) being made of excrementitious matter, has no blood veſſels.

CUTIS OR TRUE SKIN, is a very compact, ſtrong, and ſenſible membrane extended over all the other parts of the body, having nerves terminating ſo plentifully in all its ſuperficies, for the ſenſe of touching, that the fineſt pointed inſtrument can prick no where without touching ſome of them. Theſe nerves are ſaid by Malpighi, and others, who have examined them carefully, to terminate in ſmall pyramidal Papillæ; nevertheleſs to me it ſeems, that a plain ſuperficies of the ſkin (I do not mean mathematically plain) is much fitter and more agreeable to what we experience of this ſenſation; for a plain ſuperficies expoſing all the nerves alike, I think would give a more equal ſenſation, while nerves ending in a pyramidal Papilla would be exceeding ſenſible at the Vertex of that Papilla; and thoſe at the ſides and round the baſe, which would be far the greateſt part, would be the leaſt uſeful.

GLANDULÆ MILIARES, are ſmall bodies like millet ſeeds, ſeated immediately under

the ſkin in the Axilla's; and are ſaid to have been found under all other parts of the ſkin, where they have been looked for with microſcopes: Theſe glands are ſuppoſed to ſeparate ſweat; which fluid was formerly thought to be only the Materia Perſpirabilis flowing in a greater quantity, and condenſed; but Sanctorius has aſſured us, that it is not ſo, and that more of the Materia Perſpirabilis is ſeparated in equal times than of ſweat; of the former, he ſays, uſually fifty two ounces a day in Italy, where his experiments were made, and of the latter not near ſo much in the moſt profuſe ſweats; which, I think, favours the opinion of the exiſtence of theſe glands, unleſs the ſweat being once condenſed upon the ſkin, prevents a greater effuſion of that matter. Now that the whole body, every part of which is ſurely perſpirable (or how elſe could extravaſated blood or matter ever be diſſipated, unleſs it could be abſorbed into the veſſels, which ſeems impoſſible, ſeeing that the fluids which are in motion in the veſſels muſt out-balance thoſe which are extravaſated) ſhould perſpire fifty two ounces in a natural day, is not at all incredible. But that theſe glands, if there are ſuch under all the ſkin, ſhould be able to make ſo large ſecretions appear not very probable to me, however I wiſh thoſe who have more leiſure and judgment than my ſelf, would examine this more nicely, becauſe

becaufe fo much theory of cutaneous difeafes depends upon it.

MEMBRANA ADIPOSA, is all that membrane immediately under the fkin, which contains the fat in cells; it is thickeft on the Abdomen and buttocks, and thinneft neareft the extremities; and where the mufcles adhere to the fkin, and on the Penis, none. It contributes to keep the inner parts warm, and by filling the interftices of the mufcles, renders the furface of the body fmooth and beautiful, and may perhaps ferve to lubricate their furfaces, and whether the decreafe of fat which often follows labour or ficknefs, proceeds from its being reaffumed into the blood veffels, or whether it is conftantly perfpiring through the fkin, and the leffening of its quantity is from the want of a fupply equal to its confumption, is with me a matter of doubt, though the former opinion I know generally prevails.

MAMMÆ, the BREASTS, feem to be of the fame ftructure in both fexes, but largeft in women. Each breaft is a conglomerate gland to feparate milk, feated in the Membrana Adipofa, with its excretory ducts, (which are capable of very great diftention,) tending toward the nipple, which as they approach, they unite, and make but a few ducts at their exit. There are to be met with in authors, inftances fufficiently attefted of mens giving fuck, when

they have been excited by a vehement desire of doing it: And it is a common observation, that milk will flow out of the breasts of new-born children, both male and female.

CHAP. II.

Of the Membranes in general.

EVERY distinct part of the body is covered, and every cavity is lined with a single membrane, whose thickness and strength is as the bulk of the part it belongs to, and as the friction to which it is naturally exposed.

THOSE membranes that contain distinct parts, keep the parts they contain together, and render their surfaces smooth, and less subject to be lacerated by the actions of the body. And those which line cavities, serve to render the cavities smooth, and fit for the parts they contain to move against.

THE membranes of all the cavities that contain solid parts, are studded with glands, or are provided with vessels, which separate a Mucus to make the parts contained move glibly against one another, and not grow together. And those cavities which are exposed to the air, as the nose, ears, mouth, and Trachea Arteria, have their membranes beset with glands

glands, which ſeparate matter to defend them from the outer air. Thoſe membranes that have proper names, and deſerve a particular deſcription, will be treated of in their proper places.

CHAP. III.

Of the ſalivary Glands.

PAROTIS or MAXILLARIS SUPERIOR, is the largeſt of the ſalivary glands; it is ſituate behind the lower jaw, under the ear; its excretory duct paſſes over the upper part of the Maſſeter muſcle, and enters the mouth through the Buccinator. This gland has its Saliva promoted by the motions of the lower jaw. Its duct paſſes over the tendinous part of the Maſſeter muſcle that it may not be compreſſed by that muſcle, which would obſtruct the Saliva in it, though it is frequently ſaid that it paſſes over that muſcle that it may be compreſſed by it to promote the Saliva. In ſheep and calves, their jaws being long, this muſcle is inſerted far from the center of motion, that the end of the jaw may be moved with ſufficient ſtrength, and that diſtant inſertion requiring a greater length of muſcle, that its motion may be quick enough, no part of

this muſcle could be allowed to be tendinous, therefore it ſeems, to avoid the inconvenience of compreſſion from the muſcle, the duct in thoſe animals goes quite round the lower end of it. When this duct is divided by an external wound, the Saliva will flow out on the cheek, unleſs a convenient perforation be made into the mouth, and then the external wound may be healed. I have ſeen two patients with this gland ulcerated, from which there was a conſtant effuſion of Saliva, 'till the greateſt part of the gland was conſumed with red mercury precipitate; and then it healed with little trouble. Hildanus mentions the ſame caſe, which for two years had been under the care of a ſurgeon without ſucceſs; and was at laſt cured by the application of an actual cautery.

MAXILLARIS INFERIOR, is ſituate between the lower jaw, and the tendon of the digaſtrick muſcle; its duct paſſes under the Muſculus Mylohyoideus, and enters the mouth under the tongue, near the Dentes Inciſorii. I was at the opening of a woman who was ſuffocated by a tumour which begun in this gland; it extended it ſelf from the Sternum to the parotid gland on one ſide in ſix weeks time, and in nine weeks killed her. It was a true Schirrus, and weighed twenty ſix ounces. In a man which I diſſected, I found a quantity of Pus

Pus near this gland, and a bundle of matter not unlike hair as large as an hen's egg.

SUBLINGUALIS, is a ſmall gland ſituated under the tongue, between the jaw and the Ceratagloſſus muſcle. In a calf I found ſeveral ducts of this gland filled by an injection into the duct of the ſubmaxillary gland; but Morgagni and others affirm that the ducts of this gland enter the mouth directly from the gland in ſeveral places near the grinding teeth.

TONSILLA, is a globular gland about the bigneſs of a hazel-nut, ſituate upon the Pterygoideus Internus muſcle, between the root of the tongue and the Uvula. It has no duct continued from it, but empties all its ſmall ducts into a Sinus of its own, which Sinus, when the gland is inflamed, may eaſily be miſtaken for an ulcer. This gland with its fellow, direct the maſticated aliment into the Pharynx; and alſo ſerve for the Uvula to ſhut down upon when we breathe through the noſe. They are compreſſed by the tongue and the aliment, when the former raiſes the latter over its root, and thereby opportunely emit their Saliva to lubricate the food for its eaſier deſcent through the Pharynx. A ſchirrous tumour of either of theſe glands is a common diſeaſe, and it admits of no remedy but extirpation; yet it muſt not be performed upon the whole gland, but ſo much of it as is become ſupernaturally eminent; becauſe

becauſe that would be dangerous as well as difficult. The beſt way of extirpating theſe glands is, I think, by ligature: if the gland is ſmall at its baſis, the ligature may be tied round it, which I have eaſily performed by fixing the ligature to the end of a probe, which I bent, and ſo drew it round the gland, and tied it; about five days after this ligature growing looſe, I put on another in the ſame manner, and then in a few days the gland dropped off: But meeting with another caſe of this kind, where the baſis of the gland was too large to tie, I contrived an Inſtrument like a crooked needle ſet in a handle with an eye near the point; I thruſt this inſtrument, with a ligature in it through the bottom of the gland, and then taking hold of the ligature with a hook, I drew back the inſtrument; then drawing the double ligature forwards, I divided it, and tied one part above and the other below, in the ſame manner that I did to extirpate part of the Omentum in the cure of an Hernia: See the plate at the latter end of this book, and this ſucceeded as well as the former. I once ſaw them totally deſtroyed by venereal ulcers, and the Uvula, which was whole, having nothing to ſhut againſt, the patient ſnuffled almoſt as much as if the Uvula had been gone.

Pressure upon the ſurface of a gland very much promoting the ſecretion that is made

made in it, theſe glands are ſo ſeated as to be preſſed by the lower jaw, and its muſcles, which will be chiefly at the time when their fluid is wanted; and the force with which the jaw muſt be moved, being as the drineſs and hardneſs of the food maſticated, the ſecretion from the glands depending very much upon that force; it will alſo be in proportion to the drineſs and hardneſs of that food which is neceſſary; for all food, being to be reduced to a pulp, by being mixed with Saliva before it can be ſwallowed fit for digeſtion, the drier and harder foods needing more of this matter, will from this mechaniſm be ſupplied with more than moiſter foods in about that proportion in which they are drier and harder; and the drier foods needing more Saliva than moiſter, is the reaſon why we can eat leſs and digeſt leſs of theſe than thoſe. What quantity of Saliva theſe glands can ſeparate from the blood, in a given time, will be hard to determine, but in eating of dry bread it cannot be leſs than the weight of bread; and many men, in a little time, can eat more dry bread than twice the ſize of all theſe glands; and ſome men, that are not uſed to ſmoaking, can ſpit half a pint in the ſmoaking one pipe of tobacco; and ſome men in a ſalivation, have ſpit, for days or weeks together, a gallon in four and twenty hours; and, yet I believe, all theſe glands put together, do not weigh more than four ounces.

THE

The membrane which lines the mouth and palate, and covers the tongue, is every where beset with small glands, to afford Saliva in all parts of the mouth to keep it moist; for those more remote are chiefly concerned in time of mastication. These small glands have names given them according to their respective situations, as Buccales, Labiales, Linguales, Fauciales, Palatinæ, Gingivarum, and Uvulares.

A gland is chiefly composed of a convolution of one or more arteries of a considerable length, from whose sides arise vast numbers of excretory ducts, as the lacteals arise from the guts, and for the same reason; for the passages into the excretory ducts of a gland, being such as that only one sort of fluid may pass into them, the want of largeness is compensated by their number; and in a great length of an artery, as in the guts those proper fluids which escape one duct may pass into another; and from what has been said, it does not appear but that excretory ducts may arise from the vessels that form membranes without being convolved at all. And this way I imagine secretions are made from all the membranes that line cavities, and some others. There also arise from these arteries lymphatic vessels, whose use seems to be to take off the thinnest part of the blood, where a thick fluid is to be secreted, seeing they are found in greatest plenty in such glands as

separate

separate the thickest fluids, as in the testicles and liver; and it is observable that where the thickest secretions are made, the velocity of the blood is the least, as if it was contrived to give those seemingly more tenacious parts more time to separate from the blood. The arteries that compose different glands are convolved in different manners, but whether or no their different secretions depend upon that, I doubt will be difficult to discover. The excretory ducts arise from the arteries, and unite in their progress as the roots of trees do from the earth, and as different trees, plants, fruits, and even different minerals, in their growing, often derive their distinct proper juices from the same kind of earth; so the excretory ducts in different glands, separate from the same blood their different juices: But what these different secretions depend upon, whether the structure of the parts or different attractions, are what we have no certainty about, though this subject has employed several of the best writers. For my own part, from the great simplicity and uniformity usually seen in nature's works, I am most inclined to think different secretions arise from different attractions, seeing that in plants and minerals there seems to be no other way.

CHAP.

CHAP. IV.

Of the Peritoneum, Omentum, Ductus Alimentalis and Mesentery.

PERITONEUM, is a membrane which lines the whole cavity of the Abomen. It contains the liver, ſpleen, omentum, ſtomach, guts and meſentery, with all their veſſels and glands; the upper part of it is no other than the proper membrane of the diaphragm, and, but for compliance with cuſtom, there is no more reaſon for calling that, part of the Peritoneum, than there is for calling the membrane on the other ſide of the diaphragm part of the Pleura or Mediaſtinum. The fore part next the muſcles of the Abdomen, and their tendons may be divided into two Laminæ, yet I think anatomiſts in deſcribing the duplicature or Laminæ of the Peritoneum have not always meant this diviſion, but have taken the tendons of the tranſverſe muſcles for the outer Lamina, and conſidered the other as one membrane, ſeeing that it is between theſe tendons and the Peritoneum that the water is uſually found in that kind of dropſy which is called the dropſy in the duplicature of the Peritoneum. Upon the loins the inner ſurface only is ſmooth, and the

outer part a ſort of looſe Membrana Adipoſa, in which are contained the Aorta, Vena Cava, Vaſa Spermatica, and Pancreas, with other parts of leſs note. The middle of the Peritoneum upon the loins is joined to the meſentery in ſuch a manner, as makes ſome account it a production of the Peritoneum, and ſome part of the external membrane of the Duodenum, becoming one membrane with the inner or ſmooth Lamina of the Peritoneum, and part of the Rectum is covered in the ſame manner; but the kidneys and bladder of urine are contained in a diſtinct duplicature of this membrane. The dropſy of the Peritoneum, may be diſtinguiſhed, by being leaſt prominent about the navel, for there the tendons and the Peritoneum will not ſeparate; and the water, in thoſe that I have diſſected, had made the parts where it was contain'd as foul as any ulcer; therefore none of them I preſume could have been cured by operation.

For the Umbilical veſſels, ſee chap. of the Fœtus. For the Proceſſus Vaginalis, chap. of the parts of generation in men.

Omentum, or Cawl, is a fine membrane larded with fat, ſomewhat like net-work: It is ſituated on the ſurface of the ſmall guts, and reſembles an apron tuck'd up; its outer or upper part, named Ala Superior, is connected to the

the bottom of the ſtomach, the ſpleen, and part of the Inteſtinum Duodenum; and thence deſcending a little lower than the navel, is reflected and tyed to the Inteſtinum Colon, the ſpleen, and part of the Duodenum: This laſt part is called Ala Inferior; and the ſpace between the Alæ is named Burſa. This cavity is very diſtinct in moſt brutes, but ſeldom ſo in men. Sometimes both Alæ are tied to the liver, and, in diſeaſed bodies, to the Peritoneum. Its uſe is, to lubricate the guts, that they may the better perform their periſtaltick motion. Malpighi deſcribes adipoſe ducts in this membrane to carry the fat from the cells into the Vena Portarum, and thinks it a neceſſary ingredient in the bile. In dropſies of the Abdomen, and in perſons who from any other cauſe have died tabid, it is generally rotten and decayed; and ſometimes the guts in theſe caſes adhere to one another: But whether theſe adheſions proceed from the Omentum's ceaſing to perform its office, or from the periſtaltick motion of the guts, being long diſcontinued through abſtinence, or both, I cannot determine. I have ſeen one inſtance, from diſſection, of a very large rupture of the Omentum, or Epiploon, into the groin, together with one of the guts; the rupture of the Omentum, is called by authors Epiplocele.

6

DUCTUS

DUCTUS ALIMENTALIS, is the Œsophagus, ſtomach and guts, viz. Duodenum, Jejunum, Ileum, Colon, Cæcum or Apendicula Vermiformis, and Rectum.

ŒSOPHAGUS or gullet, is the beginning of the alimentary duct; its upper part is wide and open ſpread behind the tongue to receive the maſticated aliment; it begins from the baſis of the ſcull near the Proceſſus Pterygoides of the ſphenoidal bone, then deſcending becomes round, and is called Vaginalis Gulæ; it runs from the tongue cloſe to the ſpine, under the left Subclavian blood veſſels, into and through the Thorax on the left ſide, then piercing the diaphragm, it immediately enters the ſtomach. It is compoſed of a thin outer coat, which is no more than a proper membrane to the middle or muſcular coat. The middle coat is compoſed of longitudinal and circular muſcular fibres, but chiefly circular, abundantly thicker than the ſame coat in the guts; becauſe this has no foreign power to aſſiſt it, as the guts have, and becauſe it is neceſſary the food ſhould make a ſhorter ſtay here than there. The inner coat, is a pretty ſmooth membrane, beſet with many glands, which ſecrete a mucilaginous matter, to defend this membrane, and render the deſcent of the aliment eaſy.

VENTRICULUS, the ſtomach, is ſituated under the left ſide of the diaphragm, its left Tab. xiv. 6.

left ſide touching the ſpleen, and its right is covered by the thin edge of the liver; its figure nearly reſembles the pouch of a bag-pipe, its left end being moſt capacious, the upper ſide concave and the lower convex; it has two orifices, both on its upper part; the left (through which the aliment paſſes into the ſtomach) is named Cardia; and the right (through which it is conveyed out of the ſtomach into the Duodenum) is named Pylorus; where there is a circular valve which hinders a return of aliment out of the gut, but does not wholly hinder the gall from flowing into the ſtomach.

The coats of the ſtomach are but three; the external membranous, the middle muſcular, whoſe fibres are chiefly longitudinal and circular, the inner membranous, and beſet with glands, which ſeparate a Mucus. This laſt coat is again divided by anatomiſts into a fourth, which they call Villoſa. As the muſcular coat of the ſtomach contracts, the inner coat falls into folds, which increaſe as the ſtomach leſſens, and conſequently retard the aliment moſt when the ſtomach is neareſt being empty.

The manner in which digeſtion is performed has been matter of great controverſy. The ancients generally ſuppoſed the food concocted by a fermentation in the ſtomach: But the moderns more generally attribute it to the muſcular force of the ſtomach; which Dr. Pitcairne has

has computed to be equal to a hundred and ſeventeen thouſand and eighty eight pound weight, to which being added the abſolute force of the diaphragm and abdominal muſcles; (but for what reaſon I am at a loſs to conceive, when ſo ſmall a part of that force can be exerted this way) the ſum then will be more than twice as much; a force indeed equal to the end for which he aſſigns it. Now this force of the muſcular coat of the ſtomach is near forty times greater than what Borelli has aſſigned to the heart, which is much ſtronger; and Dr. Keil has undertook to prove, that the force which the heart exerts is not thrice as many ounces as Borelli computes it to be thouſand pounds weight. And this is as certain as that action and reaction are the ſame; that the abdominal muſcles and the diaphragm, compreſs the ſtomach with no greater force than they do the liver and all other parts contained in the Abdomen; and that the Fœtus in Utero, and all the Viſcera in the Abdomen, receive much more of this force, during the time of geſtation; and yet neither the Fœtus, nor any other contained part, is digeſted by that force; and for the force with which the ſtomach it ſelf acts, it will be juſt the ſame with the reaction of the food upon it, and therefore ſhould be as much more liable to be digeſted by this and the other force than the food, as it oftner feels theſe forces

than that, (only that living bodies are not ſo liable to digeſtion as dead ones): Beſides, I think it may be demonſtrated, that the force with which the ſtomach compreſſes any part of its contents, is not greater than what is given to equal parts of the contents in the ſmall guts; for if the moment of a muſcle is as its weight, and if the muſcular coat of the ſtomach does not bear a greater proportion to the muſcular coat of a ſmall gut, than their diameters bear; a ſection of the ſtomach, having ſo many more equal parts to preſs than a like ſection of a gut; it will require juſt ſo much more force to give each part the ſame preſſure. Dr. Drake has ſuppoſed, that digeſtion is performed in the ſtomach, as in Papin's digeſter, in which hypotheſis are contained all the abſurdities of that of Pitcairne's, with this addition, that the ſtomach muſt be as irreſiſtible to diſtention at that time, as his iron pot, and the orifices as forcibly ſecured; but then indeed it ſhews how bits of bones, which dogs ſwallow may be retained in the ſtomach without tearing it; which difficulty, in my opinion, Dr. Picairne has not ſufficiently accounted for, though it is none of the leaſt in his hypotheſis. In granivorous birds, where digeſtion is made by muſcular force, their ſecond ſtomach is plainly contrived for comminuting or digeſting their food that way; for beſides that it is one of the ſtrongeſt muſcles in

their bodies, its inſide is defended with a hard and ſtrong membrane that it may not be torn; and theſe birds always eat with their grain the rougheſt and hardeſt little ſtones they can find, which are neceſſary for grinding their food, notwithſtanding it is firſt ſoaked in another ſtomach, and is alſo food of very eaſie digeſtion. In ſnakes, ſome birds, and ſeveral kinds of fiſh, which ſwallow whole animals, and retain them long in their ſtomachs, digeſtion ſeems to be performed by a Menſtruum; for we frequently find in their ſtomachs animals ſo totally digeſted, before their form is deſtroyed, that their very bones are made ſoft. In horſes and oxen, digeſtion is but little more than extracting a tincture; for in their excrements, when voided, we ſee the texture of their food is not totally deſtroyed, though graſs in particular ſeems to be of as eaſy digeſtion as any food whatever, and the corn they eat is often voided entire; and in the excrements of men, are often ſeen the ſkins of fruits undigeſted, and ſmall fruits, ſuch as currants, unbroke, and worms alſo continue unhurt, both in the ſtomach and guts. Therefore by comparing our ſtomachs with thoſe here mentioned, it appears to me that our digeſtion is performed by a Menſtruum which is chiefly Saliva, aſſiſted by the action of the ſtomach, and the abdominal muſcles, and by that

of corruption which is in all dead bodies. For digeſtion is no other than corruption of our food, and therefore quantities of hot ſpirits, which hinder the corruption of animal bodies, alſo hinder digeſtion.

Duodenum, is the firſt of the three ſmall guts; it begins from the Pylorus of the ſtomach, and is thence reflected downward; it firſt paſſes by the gall-bladder, and then under the following gut and meſentery, and coming in ſight again in the left Hypochondrium, it there commences Jejunum, which is the ſecond of the ſmall guts; but the place where this ends and the other begins, is not preciſely determined.

Tab. xiv. 7. Jejunum, is ſo called from its being found for the moſt part empty; it is ſituated in the Regio Umbilicalis, and makes ſomewhat more than a third part of the ſmall guts. It is diſtinguiſhed from the following gut by its coats, which are a ſmall matter thinner, and leſs pale.

Tab. xiv. 7. Ileum, is the continuation of the former, ſituated in the Hypogaſtrium, and very often ſome part of it in the Pelvis of the Abdomen, upon the bladder of urine; eſpecially in women, it enters the Colon on the right ſide, near the upper edge of the Os Ilium. This great length of the ſmall guts is evidently for the convenience of a greater number of lacteals

lacteals, that the chyle which misses their orifices in one place may not escape them in another. But those animals which swallow their food whole, and have it a long time in their stomachs and guts, have shorter guts and fewer lacteals.

COLON, is the first of the great guts; it begins at the upper edge of the right Os Ilium; thence ascending passes under some part of the liver, and the bottom of the stomach, from the right Hypochondrium to the left, and thence descends to the Pelvis Abdominis.

CÆCUM, or Apendicula Vermiformis, is situated on the beginning of the Colon; it is less than an earth-worm, with a small orifice opening into the Colon. This gut has seldom any thing in it. In men it is called one of the large guts, though it is the smallest by far; but the mistake arises from copying the ancients, whose descriptions of all the parts contained in the Abdomen seem to be taken from dogs, for in them and in many other animals, it is very large: And some fish have them in great numbers, but very small; I have counted in a mackarell above 150.

RECTUM, is the continuation of the Colon through the Pelvis to the Anus.

THE guts have the same coats with the stomach; the fibres of their middle or muscular coat, are circular, or spiral, and longitudinal,

dinal, of the latter but very few. The antagoniſts to theſe muſcular fibres of the ſtomach and guts, are their contents preſſed from one place to another, and the muſcles of the Abdomen, for theſe preſſing upon them alter their form into one leſs capacious; which neceſſarily extends their circular fibres. The great guts have three membranes, or ligaments, on the outſide running their whole lengths, and ſupporting the Saculi, into which thoſe guts are divided. The leſſer guts, have at very ſmall diſtances ſemilunar valves placed oppoſite to the interſtices of each other; they prevent the aliment from paſſing too ſpeedily through the guts; and the better to anſwer that end, they are larger and more numerous near the ſtomach, where the food is thinner, than they are towards the Colon, where the food is continually made thicker in its progreſs, by a diſcharge of part of the chyle. But brutes have them not, becauſe they are not neceſſary to an horizontal poſture. At the entrance of the Ileum into the Colon, are two very large valves, which effectually hinder the regreſs of the Fœces into the Ileum. But clyſters have been frequently known to paſs them, and be vomited up; but the excrement that is ſometimes vomited up, I am inclined to think, is ſuch as had not paſſed into the great guts: The other valves in the Colon, are placed oppoſite

poſite (but not in the ſame plane) to each other, and make with their anterior edges an equilateral triangle; but as the gut approaches the Anus, they become leſs remarkable, and fewer in number.

ALL the guts have in their inner membrane an almoſt infinite number of very ſmall glands: Theſe glands will, ſome of them eſpecially in the large guts appear to the naked eye when they are diſeaſed: They are called Glandulæ Pyerianæ.

THE length of the guts to that of the body is as five to one in a middle-ſized man; in taller men, the proportion is uſually leſs, and in ſhort men greater.

THE following caſe I had thus related (in preſence of a great many gentlemen who had ſeen the caſe) from Mr. Punt of Cambridge, a gentleman, when living, well known for his great ſkill in Surgery.

"I WAS called to a poor woman, a few "years ſince with a mortification upon the "Abdomen. I cut away the mortified part, "and found ſome of the ſmall guts mortified. "I cut off ſo much of them as could not be "ſaved, and ſtitched the ſound part of the "gut, to a ſound part of the wound, near the "navel; to which it afterward adhered, and "ſhe recovered and voided her excrement that "way, without any notable inconvenience;

"and

" and at every ſtool part of the gut would " thruſt out, without any pain, like a Prolap- " ſus Ani: But about a year after the cure, ſhe " died of the ſtone." I do not remember that he told me what cauſed this mortification, but my honoured friend Martin Folks, Eſq; who lets nothing curious ſcape his obſervation, and was at that time of Clare-Hall in Cambridge, has informed me, " That the mortification " was made by laying hot bricks to her belly, " for the cholick, ſome of which burnt her, " and when the ſlough caſt off a gut appearing, " a female ſurgeon took it for a bliſter and clip- " ed it, upon which the excrement came out " of the wound, and then they ſent for Mr. " Punt.

The following caſe, was of a patient to Mr. Walter, a Surgeon, at Lewis in Suſſex, whom I have heard relate it; but for this account as well as the cut, I am obliged to my ingenious friend Dr. Ruſſel, who ſaw the caſe; but I cannot be of Mr. Walter's opinion, that it was the Colon that was mortified.

SIR,

" MRs. Stoneſtreet, of Lewis in Suſſex, " had the Exomphalos above twenty " years, before it was attended with the fol- " lowing accident. In the year 1700, the " twenty eighth of May, ſhe was taken with

" a cholick, and a total ſuppreſſion of ſtools;
" the inteſtine mortified, and part of it was
" taken off by Mr. Walter, a Surgeon, who
" gave me an account of the caſe, and aſſured
" me it was the Colon; the other part was
" thruſt out daily by the periſtaltick motion of
" the guts, when the excrements were voided,
" till it adhered to the wound; and had the
" juſt appearance of what is expreſſed in the
" picture I ſent you. I had a perfect exami-
" nation of it in her life-time, but no oppor-
" tunity of opening her after death; the ſides
" of the inteſtine firmly adhered to the belly,
" and the part which hung out, looked like a
" pale ſcarlet ſtrawberry, that had not its full
" ripeneſs; and the coats of it were extremely
" thickened. She lived in this condition twelve
" years, and died of a fever, with ſcorbutick
" ſwellings in her legs.

I am Sir, &c.

Richard Russel.

The following caſe happened in my own practice: Margaret White, the wife of John White, a penſioner in the fiſhmongers alms-houſes, at Newington in Surry, in the fiftieth year of her age had a rupture at her navel, which continued till her ſeventy third year, when after a fit of the cholick it mortified, and ſhe Tab.xxiv.

being presently after taken with a vomiting, it burst. I went to her and found her in this condition, with about six and twenty inches and an half of the gut hanging out mortified. I took away what was mortified, and left the end of the sound gut hanging out at the navel, to which it afterwards adhered, and she recovered. It is now three years since this accident happened, and she continues perfectly well, voiding the excrements through the Intestine at the navel, and though the ulcer was so large after the mortification separated, that the breadth of two guts was seen; yet they never at any time protruded out at the wound, though she was taken out of her bed and sat up every day.

But for a case nothing inferior to any of these, I am obliged to a farrier, or doctor for cattle, as he styles himself: The truth of this case is known to numbers of persons; as Mr. Hunt, a gentleman of unquestionable veracity has informed me, before whom the following account was given upon oath.

"Thomas Brayn of Yeaton, in the "parish of Baschurch, and county of "Salop, a doctor for cattle, maketh oath, "that about ten or twelve years agone, he "was sent for by a farmer or husbandman, who "lived near the village called Maesbrooks, "and very near to the river Verney, in the said "county

" county of Salop, to have his advice about
" an ox he had, which was there ſick by reaſon
" he could not dung; he had been drenched
" by ſeveral beaſt-doctors, before this depo-
" nent came to him. This deponent ſeeing this
" ox in the condition he was in, told the own-
" er, that if he would venture his ox, he would
" do him what ſervice he could, in the curing
" of him; which the owner conſented to, and
" thereupon this deponent opened the ox in
" the flank, and took out great part of his
" bowels, upon ſearching of which he found
" there was a perfect ſtoppage in the guts; and
" the gut was about the ſtoppage putrified
" for about three quarters of a yard, where-
" upon this deponent cut off ſo much of the
" gut as was putrified, and took it quite away,
" and then drew the ends of the guts which
" remained ſound after what was cut off, to-
" gether upon a hollow keck, which was about
" three or four inches long, and ſewed the
" ſaid ends of the guts together upon the ſaid
" keck, leaving the keck within the guts; and
" then ſewed up the hole cut in the hide upon
" the flank of the ſaid ox; and this deponent
" further ſaith, that within the ſpace of one
" hour after this operation was performed,
" the ox dunged; and the piece of the keck
" which the ſaid ends of the gut were ſewn
" upon and left within the guts, came away
" from

" from the ox with the dung, whereupon the
" ox recovered and lived to do the owner
" service several years.

Jurat, decimo septimo die Julii, anno Dom. 1716. coram Tho. Hunt.	The mark of = Thomas Brayn.

Mesentery, is a membrane beginning loosely upon the loins, and is thence produced to all the guts: It preserves the Jejunum and Ileum from twisting in their peristaltick or vermicular motion, and confines the rest to their places. It sustains all the vessels going to and from the guts, viz. arteries, veins, lymphæducts, lacteals and nerves, and also contains many glands, called from their situation Mesentericæ. The beginning of this membrane from the loins, is about three or four inches broad, but next the guts of the same length, with the side of the guts they adhere to, which is in the small guts about a fourth part shorter than the other side; but when this membrane is separated from the small guts, it shrinks, and measures about two thirds less.

I opened a boy about twelve years old, that died of the iliac passion; the guts, stomach, Duodenum and Jejunum were distended, with vapour and air, to near ten times their natural

natural capacity, which so compressed the Intestinum Ileum, that nothing could pass through it. The relations of this boy could give no other account of the cause of this disease, than that of his having eaten a large quantity of raw young carriots. This case happens very frequently to lambs that have been housed, and turned out early in the spring to grass, when the grass is very rank and succulent; and also to horses, oxen and sheep, when they happen to feed by any accident, upon young beans or peas, or rich clover grass, which are full of air, and very apt to ferment and expand in their stomachs: In these animals this case is commonly cured by running a knife into their guts, some instances of which I have seen, and have heard a great many reported; but this case happening very rarely to men, and being to be cured sometimes by the swallowing of crude mercury, I believe that praccice has never yet been used; though the instrument which is used for tapping in a dropsie of the Abdomen, would do it with great ease and safety. Some anatomists, who have considered the impossibility of a twisting of the guts, (which is the vulgar name of this disease) have imagined that it proceeded from one gut being involved in another, but these involutions, are found in most bodies that die a natural

a natural death, and without any inflammation, or any other ſymptom of pain.

CHAP. V.

Of the liver, gall-bladder, pancreas and ſpleen.

Tab. xiv. xv. 4.

THE LIVER, is the largeſt gland in the body, of a duſky red colour. It is ſituated immediately under the diaphragm in the right Hypochondrium; its exterior ſide is convex, and interior concave; backward toward the ribs it is thick, and thin on its forepart, where it covers the upper ſide of the ſtomach, and ſome of the guts; the upper ſide of it adheres to the diaphragm, and is alſo tyed to it and the Sternum by a thin ligament, which is deſcribed commonly as two; the upper part called Suſpenſorium, and the anterior Latum; but either of theſe names is ſufficient for it all: It is alſo tied to the navel by a round ligament called Teres or Umbilicale, which is the umbilical vein degenerated into a ligament; it is inſerted into the liver at a ſmall fiſſure in its lower edge. The Ligamentum Latum or Suſpenſorium, ſuſtains the liver in an erect poſture, or rather fixes it in its ſituation, while it is ſupported

ported by the other Viſcera, they being compreſſed by the abdominal muſcles; in lying down, the Teres prevents it from preſſing on the diaphragm; and in lying on the back, they both together ſuſpend it, that it may not compreſs and obſtruct the aſcending Vena Cava. I ſuppoſe it is nouriſhed by the branches of the celiac and meſenteric arteries in the liver called Arteriæ Hepaticæ, but its blood-veſſels, that compoſe it as a gland, are the branches of the Vena Portæ, which enters the liver, and diſtributes its blood like an artery, to have the bile ſecreted from it (Vid. Vena Portæ) and Tab. xix.
the branches of the Cava in the liver, which return the redundant blood into the Cava Aſcendens; it has alſo ſeveral branches of nerves, and Tab. xx.
a great number of lymphaticks: Of which I 7, 8.
ſhall treat in their reſpective places. Dogs and cats and other animals, that have a great deal of motion in their backs, have their livers divided into many diſtinct lobules; which by moving one upon another, comply with thoſe motions, which elſe would break their livers to pieces.

The gall-bladder, is a receptacle of bile, Tab. xv.
ſeated in the hollow-ſide of the liver; it is com- 13. xx. 3.
poſed of one denſe coat ſomewhat muſcular, which is covered with a membrane like that of the liver; and is alſo lined with another, that cannot eaſily be ſeparated.

Modern anatomiſts have deſcribed a number of ſmall ducts leading from the liver to the gall-bladder, by which they ſuppoſe the gall-bladder is filled, and theſe I thought I had ſeen in a human body that died of a jaundice, when I was a very young anatomiſt; but never being able to ſee any ſince in any animal, though I have made very diligent enquiry by experiments and diſſection, I begin now to be perſuaded that there are no ſuch ducts; for if they are too little to be ſeen or filled by injections, I think they are much too little for the end for which they are aſſigned. As to the argument for the exiſtence of ſuch ducts, which is fetched from the difficulty of the gall-bladder's being filled through the Ductus Cyſticus from the Ductus Hepaticus, I think it is of no weight, becauſe the Veſiculæ Seminales, we know are filled with a thicker fluid through a leſs direct paſſage. From the gall-bladder towards the
Tab.xx.4. Duodenum, runs a duct called Cyſticus; and
Tab.xx.1. from the liver to this duct, one called Hepaticus, which carries off the gall this way, when
Tab.xx.5. the gall-bladder is full; then the ductus Cyſticus and Hepaticus being united, commence Ductus Communis Choledochus, which enters the Duodenum obliquely about four inches below its beginning. The orifice of this duct in the gut is ſomewhat eminent, but has no caruncle, as is commonly ſaid. As the liver from

from its situation in the same cavity with the stomach, will be most pressed and consequently separate most gall when the stomach is fullest, which is the time when it is most wanted; so the gall-bladder, being seated against the Duodenum, will have its fluid pressed out by the aliment passing through that gut, and consequently at a right time, and in due proportion; because the greater that quantity of aliment is, the greater will be the compression; and so the contrary.

PANCREAS, the sweet-bread, is a large gland of the salivary kind, lying a-cross the upper and back-part of the Abdomen, near the Duodenum; it is what the antients called a conglomerate gland, appearing so without dissection to the naked eye; it has a short excretory duct, about half as large as a crow-quill, though it is commonly painted as large as the Ductus Communis Choledochus: It always enters the Duodenum together with the bile duct; but in dogs some distance from it; and, I think, always in two ducts distant from one another. The juice of this gland, together with the bile, serves to complete the digestion of the aliment, and render it fit to enter the lacteal vessels. Tab.xv.6.

THE spleen, is seated in the left Hypochondrium, immediately under the diaphragm, and above the kidney, between the stomach Tab. xv. D.

and the ribs; it is supported by the sub-contained parts, and fixed to its place by an adhesion to the Peritoneum and diaphragm; it is also connected to the Omentum, as has been observed. The figure of it is a sort of depressed oval, near twice as long as broad, and almost twice as broad as thick: Sometimes it is divided into lobules, but for the most part, has only one or two small fissures on its edge, and sometimes none; in its colour it resembles cast-iron. The inner texture in brutes is vesicular, like the Penis; in which vesicles are found grumous blood, and small bodies, like glands: But Ruysch denies that the human spleen is of the same texture.

I KNOW no way of computing with any exactness, the quantity of bile that is usually secreted by the liver in a given time; but if it is four times as much as all the salivary glands secrete, it may be twenty four ounces for every meal; to which being added six ounces of Saliva, which, from what I have observed in the chapter of the salivary glands, I think will appear a moderate computation. And supposing the Pancreas in the same time secretes three ounces, there will then be thirty three ounces of fluids separated for the digestion of one meal; and that these necessary fluids may not be wasted in such quantities, they pass into the blood with the chyle, and may be soon

ſeparated again for the ſame uſe; and very likely, ſome of the ſame bile may be employed more than once, for digeſting part of the ſame meal: And as the liver exceeds all the glands in the body in magnitude, and its excretory ducts ending in the Duodenum, it ſeems to me to be much more capable of making thoſe large ſeparations from the blood, which are procured by catharticks, than the ſcarce viſible glands of the guts.

THE liver, ordinarily weighs, in a middle-ſized man, about three pounds twelve ounces, the Pancreas three ounces, and the ſpleen fourteen ounces. The ſpleen I have taken out of a dog, without any remarkable inconvenience to him. And I have twice, in a humane body, ſeen three ſpleens, twice two, and once four; ſome of theſe were very ſmall, others nearly equal, but all togther in any of theſe bodies, were not greater than the one which is uſually found. I have ſeen a diſeaſed liver in a man, that weighed fourteen pounds four ounces; and in a boy but nine years old, that died hydropick, I found the liver full of hydatids, and cyſts of hydatids adhering to it, which together weighed ſeven pounds, one ounce and a half, though ſeveral pints of water had been let out of it before. The ſpleen, in the ſame boy, together with the hydatids contained in its membrane, weighed three pounds:

In a man I found a diſeaſed ſpleen, weighing five pounds two ounces; and in an old man ſix foot high, I found a ſound liver, weighing no more than twenty eight ounces, and the ſpleen but ten ounces: And in a man that was cured of a dropſy, I found a Polypus very ſolid, almoſt filling the large branches of the Porta in the liver, and a ſtone betwen the liver and gall-bladder, larger than a nutmeg; and in a man that died of a jaundice, I found the Ductus Communis Choledocus, conſtricted by a ſcirrhous Pancreas, the gall-bladder extended to the ſize of a gooſe-egg, and all the ducts to twice their natural bigneſs. This is the caſe in which I thought I had ſo plainly ſeen the cyſtyhepatick ducts; I once ſaw the Ductus Cyſticus obſtructed without the gall-bladder, being diſtended ſo much as is uſual, which, I think, furniſhes us with a very probable argument againſt the exiſtence of cyſtyhepatick ducts.

CHAP. VI.

Of the Vaſa Lactea.

VASA LACTEA, are the Venæ Lacteæ, Receptaculum Chyli, and Ductus Thoracicus.

VENÆ

Venæ Lacteæ, &c. are a vaſt number of very fine pellucid tubes, beginning from the ſmall guts, and proceeding thence through the meſentery; they frequently unite, and form fewer and larger veſſels, which firſt paſs through the meſenterick glands, and then into the Receptaculum Chyli: Theſe veſſels e'er they arrive at the meſenterick glands, (or in dogs the Pancreas Aſſellii, which is theſe glands collected) are called Venæ Lacteæ Primi Generis; and thence to their entrance into the Receptaculum Chyli, Venæ Lacteæ Secundi Generis. The office of theſe veins, is to receive the fluid part of the digeſted aliment, which is called chyle, and convey it to the Receptaculum Chyli, that it may be thence carryed through the Ductus Thoracicus into the blood-veſſels.

For the following excellent deſcription (thus marked ") of the Receptaculum Chyli, and Ductus Thoracicus, I am obliged to Mr. Monro.

" Receptaculum Chyli, Pecqueti,
" or Saccus Lacteus, Van Horne, is a mem-
" branous ſomewhat pyriform bag, two thirds
" of an inch long, one third of an inch over in
" its largeſt part, when collapſed; ſituated
" on the firſt Vertebra Lumborum, to the
" right of the Aorta, a little higher than the
" Arteria Emulgens Dextra, under the right
" inferior muſcle of the diaphragm; it is form-
" ed by the union of three tubes, one from un-

" der the Aorta, the ſecond from the inter-
" ſtice of the Aorta and Cava, the third from
" under the emulgents of the right ſide. The
" Saccus Chyliferus at its ſuperior part becom-
" ing gradually ſmaller is contracted into a
" ſlender membranous pipe of about a line
" diameter, well known by the name of

" DUCTUS THORACICUS, this paſſes
" betwixt the Appendices Muſculoſæ Dia-
" phragmatis, on the right of, and ſomewhat
" behind the Aorta, then lodged in the cel-
" lular ſubſtance under the Pleura, it mounts
" between this artery and Vena Sine Pari, or
" Azygos, as far as the fifth Vertebra Tho-
" racis, where it is hid by the Azygos, as this
" vein riſes forward to join the Cava Deſcen-
" dens, after which the duct paſſes obliquely
" over to the left ſide under the Œſophagus,
" Aorta Deſcendens, and great curvature of
" the Aorta, until it reaches the left carotide,
" ſtretching farther towards the left internal
" jugular, by a circular turn, whoſe convex
" part is upmoſt; at the top of this arch it
" ſplits into two for one half line, the ſupe-
" rior branch receiving into it a large lym-
" phatick from the cervical glands. This lym-
" phatick appears by blowing and injections
" to have no valves; when the two branches
" are united, the duct continues its courſe to
" the internal jugular, behind which it de-
" ſcends,

" ſcends, and immediately at the left ſide of
" the inſertion of this vein, enters the ſuperi-
" or and poſterior part of the left ſubclavian,
" whoſe internal membrane duplicated forms
" a ſemilunar externally convex valve that
" covers two thirds of the orifice of the duct;
" immediately below this orifice a cervical vein
" from the Muſculi Scaleni enters the ſubcla-
" vian. The thin coat and valves, commonly
" ten or twelve, of this duct are ſo generally
" known, I need not mention them. In my
" notes I find little variation in the Recepta-
" culum, only its different capacities in diffe-
" rent ſubjects, and ſometimes more ducts
" concurring in the formation of it.

" The diameter of the duct varies in moſt
" bodies, and in the ſame ſubject is uniform,
" but frequently ſudden enlargements or Sac-
" culi of it are obſervable. The diviſions
" which authors mention of this duct within
" the Thorax are very uncertain: In a woman
" I diſſected laſt ſummer, at the eighth Verte-
" bra Thoracis, one branch climbed over the
" Aorta, and about the fifth Vertebra ſlipped
" back again under that arterie to the other
" branch, which continued in the ordinary
" courſe. Laſt winter I found this duct of a
" man diſcharging it ſelf entirely into the right
" ſubclavian vein.

THE

"THE precise Vertebra where it begins to "turn towards the left is also uncertain. Frequently it does not split at its superior arch, "in which case a large Saccus is found near "its aperture into the subclavian vein.

"GENERALLY it has but one orifice, "though I have seen two in one body, and "three in another; nay, sometimes it divides "into two under the curvature of the great "artery, one goes to the right, another to the "left subclavian; this however is very rare. "The lymphatick, which enters the superi-"or arch, is often sent from the thyroide "gland."

SUPPOSING there ordinarily passes five pounds of chyle in a day through the lacteals, and that four ounces of this only is added to the blood, (though it may be any other quantity for ought I know) and that a man neither decreases nor encreases during this time, then all the separations from the fluids and solids must be just five pounds; four ounces of which must be those fluids and particles of solids, which are become unprofitable; and the remaining four pounds twelve ounces, will serve as a vehicle to carry the four ounces off: So that we see for what reason more fluids are carried into the blood than are to be retained there, and how the body is by the same means both nourished and preserved in health.

THE

THE chyle is diluted in its paſſage by the lymph. Vid. chap. of the Lympaticks.

CHAP. VII.

Of the Pleura, Mediaſtinum, Lungs, Pericardium, and Heart.

PLEURA is a fine membrane which lines the whole cavity of the Thorax, except on the diaphragm, which is covered with no other than its own proper membrane; the back part of it is extended over the great veſſels, like the Peritoneum; and in regard this membrane paſſes partly under theſe veſſels, as the Peritoneum does in the Abdomen, they may be ſaid to lie in a duplicature of it; it ſerves to make the inſide of the Thorax ſmooth and equal.

MEDIASTINUM, (if we may deſcribe ſuch a membrane in the humane body) divides the Thorax lengthways, from the Sternum to the Pericardium and Pleura, which is a very ſhort ſpace, but in many brutes very conſiderable. It divides into two in men, but in brutes it is ſingle; it divides the Thorax not exactly in the middle, but towards the left ſide, and is ſo diſpoſed, that the two cavities, into which it divides the Thorax, do not end toward this membrane

membrane in an angle, but a ſegment of a circle; it hinders one lobe of the lungs from incommoding the other, as in lying on one ſide the uppermoſt would frequently do; and prevents the diſorders of one lobe of the lungs from affecting the other.

Tab. xiv. 2. THE lungs, are compoſed of two lobes, one ſeated on each ſide of the Mediaſtinum, each of which lobes are ſub-divided into two or three lobules, which are moſt diſtinctly divided in ſuch animals as have moſt motion in their backs, for the ſame end that the liver is in the ſame animals; they are each compoſed of very ſmall cells, which are the extremities of the Aſpera Arteria or Bronchos. The figure of theſe cells is irregular; yet they are fitted to each other, ſo as to have common ſides, and leave no void ſpace. Dr. Willis has given a very particular deſcription of the inner texture of the lungs, but it is wholly imaginary and falſe, as he, and they who have copied his cuts and deſcriptions could not but have known, if they had ever made the leaſt enquiry into the lungs of any animal; nor is his account of the lymphaticks on the ſurface of the lungs, at all more true than that of their texture. In the membranes of theſe cells are diſtributed the branches of the pulmonary artery and vein. The known uſes of the air's entering the lungs, are to be inſtrumental in ſpeech, and to convey Effluvia

Effluvia into the noſe, as it paſſes, for the ſenſe of ſmelling; but the great uſe of it by which life is preſerved, I think, we do not underſtand. By ſome the force of the air is thought to ſeparate the Globuli of the blood, that have cohered in the ſlow circulation through the veins; and this opinion ſeems to be favoured by the many inſtances of Polypuſſes (which are large concretions of the Globuli of the blood) found in the veins near the heart, and in the right auricle and ventricle of the heart, and their being ſo ſeldom found in the pulmonary veins, or in the left auricle or ventricle of the heart, or in any of the arteries; but if it is true that, while the blood paſſes through the lungs, many cohering Globuli are ſeparated, yet it remains to be proved that theſe ſeparations are made by the force of the air. Dr. Keil has computed the force of the air in the ſtrongeſt expirations againſt the ſides of all the veſicles, to be equal to fifty thouſand pound weight, yet if we conſider we ſhall ſtill find the moment of the air in the lungs exceeding ſmall in any ſmall ſpace. For the velocity with which the air moves in the lungs, is as much leſs than that with which it moves in the wind-pipe, as the ſquare of a ſection of the cells in the lungs is greater than the ſquare of a ſection of the wind-pipe; and therefore if the ſquare of all the extreme blood-veſſels in the lungs, do

do not bear a greater proportion to the ſquare of the large pulmonary veſſels than the ſquare of the cells do to the wind-pipe, and if the blood in theſe large veſſels moves as faſt as the air in the wind-pipe; (all which I think may be granted) then the blood moving in the ſmalleſt veſſels of the lungs with a velocity equal to that of the air in the cells, the blood will have as much more preſſure from the power that moves it in its own veſſels than the air can give upon them, as blood is heavier than air. Beſides, air preſſing equally to all ſides, and the Globuli of the blood ſwimming in a fluid; this preſſure, be it what it will, I think, can be of little uſe to make ſuch ſeparations. Indeed it may be objected that the greateſt preſſure is in expiration, yet that ſurely cannot be much greater, while the air has ſo free a paſſage out of them. Others have thought that the air enters the blood-veſſels from the cells in the lungs, and mixes with the blood; but this opinion, however probable, wants ſufficient experiments to prove it; air being found in the blood, as there certainly is, is no proof of its entering this way, becauſe it may enter with the chyle: Nor is the impoſſibility which has been urged of its entering at the lungs without the blood being liable to come out the ſame way into the veſſicles of the lungs, a good argument to the contrary; for if a pliable duct paſſes between the membranes

membranes of a veſſel, through a ſpace greater than the ſquare of its orifice, no fluid can return, becauſe the preſſure which ſhould force it back will be greater againſt the ſides of that duct than its orifice; which is the caſe of the bile duct entering the Duodenum, and the ureters entering the bladder. I think the beſt arguments for the air's entering into the blood by the lungs, or rather ſome particular part of the air, may be fetched from what the learned Dr. Halley, and others have obſerved of a man's wanting in a diving bell, near a gallon of freſh air in a minute, for if nothing but preſſure had been wanted from the air in the lungs, there may be thrice as much preſſure without any ſupply of freſh air, as upon the ſurface of the earth; and animals dying ſo ſoon in air that has been burnt, and their being ſo eaſily intoxicated by breathing air much impregnated with ſpirituous liquors, are alſo, in my opinion, arguments of a paſſage this way into the blood: Beſides, if preſſure of the air in the cells of the lungs is the only uſe of it, I do not ſee but enough of that may be had while a man is hanging, if the muſcles of the Thorax do but act upon the air which was left in the Thorax, when the rope was firſt fixed, and yet death is brought about by hanging no other way than by interrupting of the breath, as I have found by certain experiments. Dr. Drake has endea-

voured to ſhew, that the uſe of reſpiration is to aſſiſt the Syſtole of the heart; but this uſe requires that the Syſtole and Diaſtole of the heart, ſhould keep time with expiration and inſpiration, which is contrary to experience: Beſides, if his hypotheſis was true, it could only ſerve the right ventricle of the heart. The lungs of animals before they have been dilated with air, are ſpecifically heavier than water, but upon inflation they become ſpecifically lighter and ſwim in water; which experiment may be made to diſcover whether a dead child, was ſtill born or not; but if the child has breathed but a little, and the experiment is made long after, the lungs may be collapſed, and grow heavier than water, as I have experimented, which may lead a man to give a wrong judgment in a court of judicature; but then it will be on the charitable ſide of the queſtion.

Adhesions of the lungs to the Pleura are ſo common, I know not how to call it a diſeaſe; they being found ſo more or leſs in moſt adult perſons, and without any inconvenience, if the lungs are not rotten.

Tab. xiv. 1. Pericardium or heart-purſe, is an exceeding ſtrong membrane which covers the heart; its ſide next the great veſſels is partly connected to them, and partly to the baſis of the heart; but, I think, not properly perforated by thoſe veſſels, and its lower ſide is inſeparable

ſeparable from the tendinous part of the diaphragm, but not ſo in brutes, in ſome of which there is a membranous bag between it and the diaphragm, which contains a lobule of the lungs. It encloſes all the heart to its baſis; its uſes are to keep the heart in its place, without interrupting its office, to keep it from having any friction with the lungs, and to contain a liquor to lubricate the ſurface of the heart, and abate its friction againſt the Pericardium.

THE heart is a muſcle of a conick figure, with two cavities or ventricles; its baſis is fixed by the veſſels going to and from it, upon the fourth and fifth Vertebræ of the Thorax, its Apex, or point is inclined downward and to the left ſide, where it is received in a cavity of the left lobe of the lungs, as may be obſerved, the lungs being extended with air: This incumbrance on the left lobe of the lungs, I imagine, is the cauſe of that ſide's being moſt ſubject to thoſe pains which are uſually called pleuritic, which, I think, are for the moſt part inflammations in the lungs.

AT the baſis of the heart, on each ſide, are ſituated the two auricles to receive the blood; the right from the two cava's, and the left from the pulmonary-veins: In the right, at the meeting of the cava's, is an eminence called Tuberculum Loweri, which directs the blood into the auricle; immediately below this tubercle, in

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the ending of the Cava Afcendens, is the Veftigium of the Foramen Ovale; (Vid. chap. of the Fœtus) and near this, in the auricle, is the mouth of the coronary-veins. The left auricle is abundantly lefs than the right; but the difference is fupplied by a large mufcular cavity, which the veins from the lungs afford in that place; the fides of this mufcular cavity are thicker than the fides of the right auricle, in about that proportion in which the left ventricle of the heart is ftronger than the right; their ufes being to receive blood from the veins that lead to the heart, and prefs it into the ventricles; a ftrength in each auricle proportionable to the ftrength of the ventricle that it is to fill with blood, feems neceffary: And this different thicknefs of the coats of the auricles makes the blood in the left, which is thickeft, appear through it of a paler red; but when it is let out of the auricles it appears alike from both; which they would do well to examine, who affirm the blood returns from the lungs of a more florid colour than it went in; and offer it as an argument, of the blood's being mixed with air in the lungs: In both auricles are mufcular Columnæ, like thofe in the ventricles, but fmaller.

The ventricles or cavities in the heart which receive the blood, are hollow mufcles, or two cavities in one mufcle, whofe fibres interfect one

one another, ſo as to make the preſſure of the heart upon the blood more effectual, and are alſo leſs liable to be ſeparated than they would have been if they had lain parallel; both theſe cavities receiving the ſame quantities of blood in the ſame times, and always acting together, muſt be equal in ſize if they equally diſcharge what they contain at every Syſtole, as I doubt not but they do; nevertheleſs the left appears leſs than the right, it being found empty in dead bodies, and the right uſually full of blood, which made the antients think the veins and the right ventricle only, were for the blood to move in, and that the left and the arteries contained only animal ſpirits; the left ventricle is much the thickeſt and ſtrongeſt, its office being to drive the blood through the whole body, while the right propels it through the lungs only. Over the entrance of the auricles in each ventricle, are placed valves to hinder a return of blood while the heart contracts. Thoſe in the right ventricle are named Tricuſpides, thoſe in the left Mitrales. One of theſe laſt ſeem to do further ſervice, by covering the mouth of the Aorta while the ventricle fills; which ſuffering none of the blood to paſs out of this ventricle into the Aorta before the ventricle acts, it will be able to give greater force to the blood than it otherwiſe might have done; becauſe a greater quantity of blood more fully diſtend-

ing the ventricle, and making the greater refiſtance, it will be capable of receiving the greater impreſſed force from the ventricle; and if the blood is no way hindered in the right ventricle from getting into the pulmonary artery, while the ventricle dilates as it is in the left, the left then muſt be ſomewhat bigger than the right, if they both empty themſelves alike in every Syſtole: Though the auricles of the heart are equal to each other, and the two ventricles alſo equal, or nearly equal, yet the auricles are not ſo large as the ventricles; for the ventricles contain not only all the blood which flowed from the veins into the auricles, during the contraction of the heart, but alſo that which flows (which will be directly into the heart) while the auricles contract, and the ventricles dilate; which leads us to the exact knowledge of the uſe of the auricles. If the Syſtole and Diaſtole of the heart are performed in equal times, then the auricles muſt be half the ſize of the ventricles; or whatever proportion the ſpace of time of the Syſtole of the heart, bears to the ſpace of time in which thy Syſtole and Diaſtole are both performed, that proportion will the cavities of the auricles bear to the cavities of the ventricles.

THE inner fibres of each ventricle are diſpoſed into ſmall cords, which are called Columnæ: From ſome of theſe ſtand ſmall por-

tions of flesh called Papillæ; these Papillæ are tied to the valves by slender fibres, whereby they keep the valves from being pressed into the auricles, by the action of the blood against them in the Systole of the heart, and when that is over, the blood flowing in between them opens them, as the pressure of blood on the other side shut them in the Systole. (For the course of the blood through this part, Vid. chap. of the course of the aliment and fluids.)

IN the beginning of each artery from the heart are placed three valves, which look forward, and close together to hinder a regress of blood into the ventricles. Those in the pulmonary-artery, are named Sigmoidales, those in the Aorta, Semilunares, Canalis Arteriosus. (Vid. chap. of the Fœtus.)

IN a boy I found a great quantity of Pus in the Pericardium, and the basis of the heart ulcerated. In persons that have died of a dropsie, I have usually observed the heart large, its fibres lax, and the vessels about it immoderately distended, and polypusses sometimes in both auricles and ventricles, and in the large veins; but more frequently in the right auricle and ventricle. I dissected a man that died tabid, in whom the Pericardium universally adhered to the heart, and a portion of the muscular part of the heart was ossified as large as a six-pence. The beginning of the Aorta, has been Tab.ix.A.

frequently ſeen oſſified, eſpecially in aged perſons. In a woman that died of a dropſie, I found the valves of the Aorta quite covered with chalk ſtones, which not ſuffering the valves to do their office, the left ventricle of the heart was conſtantly overcharged with blood, and diſtended to above twice its natural bigneſs, which I imagine deſtroyed the œconomy of the body, and occaſioned the dropſie.

CHAP. VIII.

Of the arteries and veins.

FROM the right ventricle of the heart ariſes the pulmonary artery, which ſoon divides into two branches, one to each lobe of the lungs, and then they ſub-divide into ſmaller and ſmaller branches, until they are diſtributed through every part of the lungs. From the extreme branches of the pulmonary artery, ariſe the ſmall branches of the pulmonary veins; which as they approach the left auricle of the heart, unite in ſuch a manner as the pulmonary artery divides going from the heart, only that the veins enter the muſcular appendix of the left auricle in ſeveral branches, and the blood being brought back from the lungs by theſe veſſels to the left auricle and ventricle of the heart,

heart, it is from the left ventricle of the heart thrown into the Aorta.

Aorta, or great artery, ariſes from the left ventricle of the heart, and deals out branches to every part of the body. The firſt part of this veſſel, is called Aorta Aſcendens; it paſſes over the left pulmonary artery, and veins and branch of the Aſpera Arteria, and being reflected under the left lobe of the lungs, it commences Aorta Deſcendens; which name it keeps through the Thorax and Abdomen where it paſſes on the left ſide of the ſpine, till its diviſion into the iliac arteries between the third and fourth Vertebræ of the loins.

From under two of the ſemilunar valves of the Aorta, which is e'er it leaves the heart, ariſe two branches (ſometimes but one) which are beſtowed upon the heart, and are called Coronariæ Cordis. From the curved part of the Aorta, which is about two or three inches above the heart, ariſe the ſubclavian and carotid arteries; the right ſubclavian and carotid in one trunk, but the left ſingle. By ſome authors theſe veſſels have been deſcribed in a different manner, but I believe their deſcriptions were, for want of humane bodies, taken from brutes; for I have never yet ſeen any variety in theſe veſſels in humane bodies, though I have in the veins nearer the heart: And indeed there ſeems to me to be a mechanical neceſſity for their go-

ing off in the manner here deſcribed in humane bodies; for the right ſubclavian and carotid arteries neceſſarily going off from the Aorta at a much larger angle than the left, the blood would move more freely into the left than the right, if the right did not go off in one trunk, which gives leſs friction to the blood, than two branches equal in capacity to that one; ſo that the advantage the left have by going off from the Aorta, at much acuter angles than the right, is made up to the right by their going off at firſt in but one branch.

THE carotid arteries run on both ſides the Larynx to the ſixth Foramina of the ſcull, through which they enter to the brain; but as they paſs through the neck, they detach branches to every part about them, which branches are called by the names of the parts they are beſtowed upon; as, Laryngeæ, Thyroideæ, Pharyngeæ, Linguales, Temporales, Occipitales, Faciales, &c. but juſt before they enter the ſixth Foramina of the ſcull, they each ſend a ſmall branch through the fifth Foramina of the ſcull to that part of the Dura Mater which contains the Cerebrum. It is theſe arteries which make thoſe impreſſions which are ſo conſtantly obſerved on the inſide of the Oſſa Bregmatis: Theſe branches Mr. Monro obſerves oftner ariſe from the temporal arteries. The internal carotids, ſend two branches to the

the back part of the noſe, and ſeveral branches through the firſt and ſecond Foramina of the ſcull to the face and parts contained within the orbits of the eyes, and then piercing the Dura Mater, they each divide into two branches, one of which they ſend under the Falx of the Dura Mater, between the two hemiſpheres of the brain, and the other between the anterior and poſterior lobes. Theſe branches take a great many turns, and divide into very ſmall branches in the Pia Mater before they enter the brain, as if large trunks would make by their pulſe too violent an impreſſion on ſo tender and delicate a part. And perhaps it may be from an increaſe of the impulſe of the arteries in the brain, which ſtrong liquors produce, that the nerves are ſo much interrupted in their uſes throughout the whole body, when a man is intoxicated with drinking; and it may alſo be from a like cauſe, that men are delirious in fevers. Beſides theſe two arteries, viz. the carotids, the brain has two more, called Cervicales, which ariſe from the ſubclavian arteries, and aſcend to the head through the Foramina, in the tranſverſe proceſſes of the cervical Vertebræ, and into the ſcull through the tenth or great Foramen; theſe two arteries uniting ſoon after their entrance, they give off branches to the Cerebellum, and then paſſing forward, divide and communicate with the carotids; and

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the carotid arteries communicating with each other, there is an entire communication between them all; and theſe communicant branches are ſo large that every one of theſe four great veſſels, with all their branches may be filled with wax injected through any one of them, as I have often experienced.

THE ſubclavian arteries, are each continued to the cubit in one trunk, which is called Axillaris as it paſſes the arm-pits, and Humeralis as it paſſes by the inſide of the Os Humeri, between the muſcles that bend and extend the cubit. From the ſubclavians within the breaſt ariſe the Arteriæ Mammariæ, which run on the inſide of the Sternum, and lower than the Cartilago Enſiformis. As ſoon as the Arteria Humeralis has paſſed the joint of the cubit, it divides into two branches, called Cubitalis Superior and Cubitalis Inferior; which latter ſoon ſends off a branch, called Cubitalis Media, which is beſtowed upon the muſcles ſeated about the cubit. The Cubitalis Superior paſſes near the Radius, and round the root of the thumb, and gives one branch to the back of the hand, and two to the thumb, one to the firſt finger, and a branch to communicate with the Cubitalis Inferior. The Cubitalis Inferior paſſes near the Ulna to the palm of the hand, where it takes a turn, and ſends one branch to the out-ſide of the little finger, another

another between that and the next finger, dividing to both, another in the ſame manner to the two middle fingers, and another to the two fore-fingers. Theſe branches which are beſtowed on the fingers, run one on each ſide of each finger internally to the top, where they have ſmall communications, and very often there is a branch of communication between the humeral and inferior cubital arteries. This communicant branch is ſometimes very large, and liable to be pricked by careleſs or injudicious blood-letters, in bleeding in the baſilic vein, immediately under which, as far as I have been able to obſerve, this branch always lies. Mr. Monro has found the ſubclavian artery divided in one ſubject into two, the exterior of which formed the Cubitalis Superior, and the inner artery, the Cubitalis Inferior; from which ſtructure he accounts for the ſucceſs in the operation of the aneuriſm ſometimes performed above the cubit. When the operation for an aneuriſm is made upon this communicant branch, it is neceſſary to tie it on both ſides of the orifice, becauſe the blood is liable to flow freely into it either way.

From the deſcending Aorta on each ſide is ſent a branch under every rib, called Intercoſtalis, and about the fourth Vertebra of the back, it ſends off two branches to the lungs, called Bronchiales, which are ſomtimes both

given off from the Aorta, ſometimes one of them from the the intercoſtal of the fourth rib on the right ſide; and as the Aorta paſſes under the diaphragm, it ſends two branches into the diaphragm, called Arteriæ Phrenicæ, which ſometimes riſe in one trunk from the Aorta, and ſometimes from the Cœliaca; but oftner the right from the Aorta, and the left from the cœliac. Immediately below the diaphragm ariſes the cœliac artery from the Aorta; it ſoon divides into ſeveral branches, which are beſtowed upon the liver, Pancreas, ſpleen, ſtomach, Omentum, and Duodenum. Theſe branches are named from the parts they are beſtowed on, except two that are beſtowed upon the ſtomach, which are called Coronaria Superior and Inferior, and the branch beſtowed upon the Duodenum, which is named Inteſtinalis. At a very ſmall diſtance below the Arteria Cœliaca from the Aorta, ariſes the Meſenterica Superior, whoſe branches are beſtowed upon all the Inteſtinum Jejunum and Ileum, part of the Colon, and ſometimes one branch upon the liver. A little lower than the ſuperior meſenteric artery, ariſe the emulgents, which are the arteries of the kidneys. And a little lower than the emulgents, forward from the Aorta, ariſe the Arteriæ Spermaticæ: For which, Vid. chap. of the parts of the generation in men. Lower laterally, the Aorta ſends branches

branches to the loins called Lumbales, and one forward, to the lower part of the Colon and the Rectum, called Mesenterica Inferior. Between the Arteria Cœliaca Mesenterica Superior, and Inferior and the branches of each near the guts, there are large communicant branches to convey the blood from one to another when they are either compressed in any posture, or streightned by being stretched out in ruptures, or from any other cause.

As soon as the Aorta divides upon the loins, it sends off an artery into the Pelvis upon the Os Sacrum, called Arteria Sacra, and the branches the Aorta divides into, are called Iliacæ, which in about two inches space divide into external and internal. The Iliacæ Internæ first send off the umbilical arteries which are dried up in adult bodies, except at their beginnings, which are kept open for the collateral branches on each side, one to the bladder, and one to the Penis in men, and in women the Uterus; the rest of these branches are bestowed upon the buttocks, and upper parts of the thighs. The Iliacæ Externæ, run over the Ossa Pubis into the thighs; and as they pass out of the Abdomen, they send off branches, called Epigastricæ, to the forepart of the integuments of the Abdomen under the Recti muscles. And the epigastrick arteries send each a branch into

the Pelvis and through the Foramina of the Offa Innominata to the mufcles thereabouts. As foon as the iliac artery is paffed out of the Abdomen into the groin, it is called Inguinalis, and in the thigh Cruralis, where it fends a large branch to the back-part of the thigh; but the great trunk is continued internally between the flexors and extenfors of the thigh, and paffing through the infertion of the Triceps mufcle into the ham, it is there called Poplitea; then below the joint it divides into two branches, one of which is called Tibialis Antica; it paffes between the Tibia and Fibula to the fore-part of the leg, and is beftowed upon the great toe, and one branch to the next toe to the great one, and another between thefe toes to communicate with the Tibialis Poftica; which artery foon after it is divided from the Antica, fends off the Tibialis Media, which is beftowed upon the mufcles of the leg, while the Tibialis Poftica goes to the bottom of the foot and all the leffer toes. The Tibialis Antica is difpofed like the Cubitalis Superior; the Poftica, like the Cubitalis Inferior; and the Media in each, have alfo like ufes. Thefe arteries which I have defcribed, are uniform in moft bodies, but the leffer branches are diftributed like the branches of trees, and in fo different a manner in one body from another, that thefe veffels, it is highly probable, are in no two bodies

bodies alike, nor the two ſides in any one body.

I HAVE once ſeen a rupture of matter, and once of blood and matter, which flowed out of the Abdomen into the fore-part of the thigh, through the ſame paſſage at which the iliac artery goes out of the Abdomen.

THE veins ariſe from the extremities of the arteries, and make up trunks which accompany the arteries in almoſt every part of the body, and have the ſame names in the ſeveral places which the arteries have, which they accompany. The veins of the brain unload themſelves into the Sinuſes, (Vid. chap. of the Dura and Pia Mater) and the ſinuſes into the internal jugulars and cervicals, and the internal jugulars and cervicals into the ſubclavians, which joining, make the Cava Deſcendens. The internal jugulars are ſeated by the carotid arteries and receive the blood from all the parts which the carotids ſerve, except the hairy ſcalp and part of the neck, whoſe veins enter into the external jugulars, which run immediately under the Muſculus Quadratus Genæ, often two on each ſide. The cervical veins, deſcend two through the Foramina in the tranſverſe proceſſes of the cervical Vertebræ, and two through the great Foramen of the ſpine, and one on each ſide the ſpinal marrow; theſe join at the loweſt Vertebra of the neck, and then empty into the ſubclavians,

clavians, and at the interſtices of all the Vertebræ communicate with one another.

The veins of the arm are more than double the number of the arteries, there being one on each ſide each artery, even to the ſmalleſt branches that we can trace, beſides the veins which lie immediately under the ſkin. Thoſe which accompany the arteries have the ſame names with the arteries; thoſe which run immediately under the ſkin on the back of the hand have no proper names, they run from thence to the inſide of the elbow; where the uppermoſt is called Cephalica, the next Mediana, the next Baſilica. Theſe all communicate near the joint of the elbow, and then ſend one branch which is more directly from the Cephalica, and bears that name, until it enters the ſubclavian vein; it paſſes immediately under the ſkin, in moſt bodies, between the flexors and extenſors of the cubit, on the upper ſide of the arm. The other branches joining, and receiving thoſe which accompany the arteries of the cubit, they paſs with them by the artery of the arm into the ſubclavian vein. The external veins have frequent communications with the internal, and are always fulleſt when we uſe the moſt exerciſe; becauſe the blood being expanded by the heat which exerciſe produces, it requires the veſſels to be diſtended, and the inner veſſels, being compreſſed by the actions of

the

the muſcles, they cannot dilate enough, but theſe veſſels being ſeated on the out-ſides of the muſcles, are capable of being much dilated; and this ſeems to me to be the chief uſe of theſe external veſſels. The Cephalick vein as it runs up the arm, is very viſible in moſt men, but in children is rarely to be ſeen; therefore great care ſhould be taken not to wound it in the cutting of iſſues in childrens arms; and I know no way to be ſure of avoiding it, but by cutting the iſſue more externally than is uſual in men, which may be done without any inconvenience.

In the Thorax, beſides the two Cava's, there is a vein called Azygos or Vena Sine Pari, it is made up of the intercoſtal, phrenic, and bronchial veins, and enters the deſcending Cava near the auricle, as if its uſe was to divert the deſcending blood from falling too directly upon the blood in the aſcending Cava, and direct the blood of the deſcending Cava into the auricle. Beſides this vein in the Thorax, are the mammary veins, one to each artery; and the veins of the heart which are called Coronariæ; they are twice the number of the arteries, but they enter the right auricle chiefly at one orifice.

In the Abdomen, (beſides the Cava Aſcendens, and the veins which are named like the arteries, viz. The emulgents from the kidneys,

the lumbal and ſpermatick veins, the Sacra, iliac and hypogaſtrick veins) there is one large one called Vena Portæ, whoſe branches ariſe from all the branches of the cœliac and two meſenterick arteries, except the branches of the cœliac and ſuperior meſenterick, which are beſtowed on the liver, and uniting in one trunk enters the liver and is there again diſtributed like an artery, and has its blood collected and brought into the Cava by the branches of the Cava in the liver; this vein being made uſe of inſtead of an artery, to carry blood to the liver, for the ſeparation of bile. It moves in this vein about eight times ſlower than in the arteries hereabouts; and this ſlow circulation being ſuppoſed neceſſary, I think, there could be no other way ſo fit to procure it; for if an artery had been employed for this uſe, and been thus much dilated in ſo ſhort a paſſage, the blood would not have moved uniformly in it, but much faſter through its Axis than near its ſides; and beſides it is very probable that the blood in this vein having been firſt employed in nouriſhing ſeveral parts, and having through a long ſpace moved ſlowly, may be made much fitter for the ſeparation of bile than blood carried by an artery, dilated to procure a circulation of the ſame velocity with that in this vein.

In the leg the veins accompany the arteries in the ſame manner as in the arm, the external veins of the foot being on the upper ſide, and from them is derived one called Saphœna, which is continued on the inſide of the limb its whole length, and has ſeveral names given it from the ſeveral places through which it paſſes.

The arteries are ſaid to have three coats, a middle muſcular, and an external and internal membranous. The veins are ſaid to have the ſame; the internal coat of an artery may be pretty eaſily ſeparated, but not the external; and though the veins have muſcular fibres, yet I could never ſeparate any one diſtinctly into three coats; and in the inſide of the veins there are many valves, eſpecially in the lower limbs, to hinder any reflux of the venal blood, which otherwiſe would have happened from the frequent actions of the muſcles on the outſides of the veins; and both the arteries and veins as they run in the inſide of a limb, or as they are diſperſed in parts that ſuffer great extenſions, as the ſtomach, guts and Uterus, they are bent in and out ſo much as that when theſe parts come to be diſtended, they may comply with thoſe diſtentions, by only being ſtreightened, and ſo preſerved from being ſtretched, which would leſſen their Diameters. The ſmall arteries near the heart go off from the large trunks at obtuſe angles, farther at leſs obtuſe

angles, then at right angles, farther ſtill at acute angles, and near the extremities at very acute angles, becauſe the blood in the veſſels far from the heart moving with leſs velocity than the blood in the veſſels near the heart, the blood in the collateral branches more remote from the heart wants the advantage of a directer courſe; and becauſe a very large branch ariſing out of another, might weaken too much the ſides of the veſſel it would ariſe from; that inconvenience is prevented by encreaſing the number, and ſo leſſening the ſize of the collateral branches, where otherwiſe one large branch would have ſerved better; as in the going off of the ſubclavian and carotid arteries, which might have gone off for ſome ſpace in one trunk; but this mechaniſm is more evident in the going off of the Arteria Cœliaca and Meſenterica Superior. And the ſmall arteries always divide ſo as that the leſſer branch may lie leaſt in the direction of the blood flowing into them, which makes the blood flow moſt freely into that branch, that has fartheſt to carry it; and the ſmaller branches ariſe more or leſs obliquely, from the ſides of other arteries, according to the proportion they bear to the arteries they ariſe from, becauſe an artery comparatively large ariſing obliquely from the ſide of another, would make an orifice in that it ariſes from too large and weaken it. And both theſe ends

are at once brought about, by making the arteries that give off the branches, bend more or leſs towards the branches they give off, according to the comparative magnitude of the branches given off.

BORELLI has computed the force which the heart exerts at every Syſtole, to be equal to three thouſand pounds weight, and the force which all the arteries exert at every Syſtole, to be equal to ſixteen thouſand pounds weight, and that they together overcome a force equal to a hundred and thirty ſix thouſand pounds weight; and Dr. Keill has computed that the heart in every Syſtole, exerts a force not exceeding eight ounces, (but in both theſe accounts a weight in motion is compared to a weight at reſt.) The firſt computation was made by comparing the heart with other muſcles, whoſe power to ſuſtain a weight could be beſt determined; and the latter was made from the velocity of the blood moving in an artery: Therefore if we conſider that Borelli's way of computing led him to find out the abſolute force of the heart, and Dr. Keill's the force which the heart uſually exerts, perhaps theſe very different computations may be accounted for; for if the force of the heart, which is conſtantly exerted, ſhould, compared with any other muſcle, be but in a reciprocal proportion to the frequency of their actions, and

the importance of their uſes; may not the heart very fitly have a force vaſtly greater than uſually it exerts, becauſe it is always in action, and muſt be able to exert a certain force in the loweſt ſtate of health? What force the heart ever exerts in a grown man, I cannot ſay; but it muſt be leſs in each ventricle than is ſufficient to burſt the valves, which hinder the blood from returning into the auricles out of the ventricles, or than is ſufficient to break thoſe threads by which theſe valves are tied to the Papillæ. In a dog I found the force which the heart would exert, would not raiſe to one foot perpendicular heighth, a column of blood through the Aorta Aſcendens. And when I inject the Arteries of a child, I find a force exceeding little will throw water through all the veſſels, with a velocity equal to that with which the blood moves in thoſe veſſels when living. And if the heart like other muſcles can perform the firſt part of its contraction with moſt eaſe, is not the quick actions of the heart in hectic fevers owing to its not being able to empty the ventricles every Syſtole, which I think will oblige it to act Cæteris Paribus ſo much the oftner. For the following ingenious attempt to account for the Syſtole and Diaſtole of the heart, and the reciprocal actions of the auricles and ventricles, I am obliged to Mr. Monro.

POSTU-

" Postulata, that the action of the muscles depends on the influx of blood and Liquidum Nervosum into the muscular fibres, and therefore whenever the muscles are deprived of either or both these fluids, their action ceases; this a great many authors have fully proved by tying and cutting the nerves or arteries that serve any muscle. That all muscles are in a constant state of contraction as long as blood and the Liquidum Nervosum are freely supplyed to them, which seems evident from the Sphincter Ani and Vesicæ, and from the continued contraction of such muscles, whose antagonists are cut assunder or paralitic. That the nerves of the heart run to it between the auricles and arteries, and that the Arteriæ Coronariæ rise from the Aorta behind the Valvulæ Semilunares, both which are evident from dissections. If then both auricles and ventricles are ready, upon the first communication of motion, to contract at the same time, the ventricles, as Dr. Keil well observes, being stronger, will first contract and hinder the contraction of the auricles, which must be in the mean time, much dilated by the influx of blood from the veins, while the arteries are also distended by the blood thrown out of the ventricles; therefore the cardiack nerves lying between the two will

" compressed, and the course of the liquids " in them stopped; at the same time the blood " that rushes out of the left ventricle into the " Aorta, pushes the valves of that artery up- " on the orifices of the Arteriæ Coronariæ, so " that no blood can enter into the substance " of the heart: Thus both causes of contraction " failing, this muscle must become paralitick. " The resistance then to the contraction of the " auricles being now removed, they will throw " their blood into the ventricles; and the im- " pulsion of the blood into the arteries from " the heart now also ceasing, the two great " arteries will be constricted: The nerves are " therefore now again free from compression, " and the valves of the Aorta being thrust " back upon the mouth of the ventricle, the " blood enters the Arteriæ Coronariæ; since the " ventricles are again supplied with both the " liquids, on which their contraction depends, " they must again act. And thus as long as these " causes continue, their effects must follow, " i. e. as long as the creature lives the heart " must have an alternate Systole and Diastole, " and the auricles and ventricles have reci- " procal actions."

If the arteries contract suppose a fourth part of the squares of their diameters at every Systole, and if the heart does not throw out a quantity at every Systole, equal to the fourth part of the

the ſolid contents of all the arteries when dilated, it is evident the heart does not throw the blood through the whole arterial ſyſtem, but into ſo much of the arteries neareſt the heart, as will contain four times as much as is thrown out of the left ventricle at once; and then this portion of arteries throws the blood forwards and dilates the arteries that lie next, and ſo on: But if the capacities of all the arteries taken together in their utmoſt dilatations, exceed their capacities in their utmoſt contractions, juſt ſo much as the quantity of blood amounts to, which is thrown out of the left ventricle of the heart at every Syſtole, then every contraction of the heart propels the blood through the whole arterial ſyſtem, and the pulſation of the arteries thus made, will begin at the Aorta immediately after the ventricle begins to contract, and ſo go on ſucceſſively to their extremities; and while the left ventricle of the heart dilates again they will contract, and the times of the Syſtole and Diaſtole of the heart and arteries always be reciprocal. The ſections of all the remoter veſſels, being greater than a ſection of the Aorta, the blood will move ſo much ſlower in the leſſer veſſels than in the greater, as the ſections of the leſſer veſſels taken together, exceed the ſection of the greater veſſel or veſſels. The ſtrength of the coats of the arteries if the blood preſſed equally againſt the ſides of

of them all, Cæteris Paribus, ought to be one to another as their circumferences, becauſe ſo much as the circumference of one artery is greater than another, ſo much greater preſſure its ſides muſt ſuſtain; but the arteries neareſt the heart, ſuſtaining the reaction of all the arterial blood, they muſt have a ſtrength yet greater than in that proportion: And the veſſels, both arteries and veins, the more diſtant they are from the head, the greater proportional Strength their coats muſt have, becauſe the arterial and venal blood communicating, they will preſs upon the lower veſſels, with a force proportional to the perpendicular altitude of blood above, which will be that of the perpendicular altitude of the whole body; for though the aſcending blood of the ateries may be ſaid not to preſs upon the deſcending, becauſe it moves another way, nevertheleſs it being thrown from the heart into one common veſſel, which afterwards divides, the blood moving both ways communicates, and that force which is neceſſary to overcome the natural inclination of the aſcending blood to deſcend, will be impreſſed alſo upon the deſcending blood, which is juſt the ſame with the weight of the aſcending blood; and the veins both from above and below communicating at the right auricle, the preſſure in them will alſo be as the perpendicular altitude of the body. So that the blood in all the veins and arteries may be

be compared to a fluid in a curved tube, in which that partin one leg, exactly balances that in the other, and both preſſing moſt upon thoſe parts which are neareſt the center of the earth. Accordingly we find by experience, that humours are moſt apt to flow to the loweſt parts, and that by laying thoſe parts upon a level with the whole body, this inconvenience is remedied; but laying a leg only in a chair does it but in part, juſt ſo much as the perpendicular altitude of the body from that part is ſhortened. There is alſo to be conſidered concerning the thickneſs of the coats of the veſſels, that the blood moving ſlower in the ſmall veſſels than in the great, the moment of the blood againſt the ſides of a ſmall veſſel, will be as much leſs than the moment of the blood againſt equal parts of a great one, as the velocity of the blood in a ſmall veſſel is leſs than that in a great one; and therefore their coats may alſo differ from the former proportion, as the velocity of the blood differs. Moſt of the ſmall veſſels in the limbs lying againſt one another are a mutual ſupport, and therefore leſs liable to be dilated or burſt than capillaries which lie in the thin membranes of cavities, ſuch as in the noſe. Hence theſe I ſuppoſe are moſt ſubject to hæmorrhages. And if hæmorrhages of blood do frequently ariſe from obſtructions in the minuteſt veſſels, does it not appear how opium and the

the bark, if they thin the blood inwardly taken (as they do moſt powerfully when mixed with it) come to be ſo often effectual remedies in that caſe? And the coats of the leſſer veſſels being proportionably weaker than the great ones, according to the decreaſe of the velocity of the blood, which leſſens the moment with which it moves in them, whenever the blood begins to move in them with an equal velocity, or greater, as it happens after an amputation when the great veſſels are tied, the force of the blood often overcomes the ſtrength of the coats of the ſmaller veſſels, and dilates them ſo, that ſometimes thoſe veſſels, which ſcarce bled during the operation, will in a few hours bleed vehemently. And this conſtant effort of the blood to dilate veſſels upon the obſtructions of others, I take to be one reaſon of thoſe throbbing pains which are felt in wounds when the bleeding is ſtopped, and in all violent Inflammations, until the collateral branches are dilated, or the tenſion of the parts otherwiſe taken off.

THE extream branches both of the arteries and veins have very numerous communications, like thoſe in the Stamina of the leaves of plants, by which communications the blood that is obſtructed in any veſſels, may paſs off by other veſſels that are not obſtructed; and ſince the moment of the blood in the veſſels leſſens, and the friction from the veſſels encreaſes as it ap-

proaches

proaches the extremities; and ſince many of the leſſer veſſels are more expoſed to preſſure than any of the large ones, thoſe communications in the leſſer veſſels are made ſo much the more numerous. By means of theſe communications, the blood circulates in a limb that has had part amputated, and into any veſſels that have been ſeparated from the trunks that ſupplied them, which otherwiſe muſt have mortified for want of nouriſhment, and with them for the ſame reaſon, all the branches that ariſe from ſuch ſeparated veſſels; and I can diſcern no other way than by theſe communications, that the fluids contained in a large inflammation, can ſuppurate into one cavity.

If we inject by the arteries a large quantity of a coloured fluid, we find all the large veins full of that liquor, before any of the ſolid parts are much coloured with it; and upon frequent repetitions all of them much leſs coloured than I think might be expected, if it had gone into any thing near all the veſſels of the body; and I have often thrown wax or tallow coloured with vermillion or verdigreaſe, through all the arteries, and back again through the veins, even to the heart, every where filling veſſels that cannot be diſcerned without a microſcope; and all this without filling or much diſcolouring any one entire part. In viewing with a microſcope the circulation of the blood in the tail of a fiſh, the

the eye eaſily traces arteries to their extremities, and their return in veins; yet all the veſſels we can ſee make but a ſmall part of the whole of what we ſee; and though we are taught that the whole animal body, is a compages of veſſels ſuch as we ſee: If it were ſo, I think we could not well diſtinguiſh any; and if the ſum of the diameters of all the veſſels we can ſee, are to that of the breadths and thickneſſes of all the reſt of the parts, which we ſee at the ſame time, taken together, but as one to five, theſe veſſels then are no more than the twenty fifth part of what we ſee with them. What then ſhall we ſuppoſe the reſt of the tail, and thoſe parts which were ſo little tinged, and thoſe which were not filled with wax, in the foregoing experiments, compoſed of? Are they not compoſed of veſſels which ariſe from the arteries, as excretory ducts do in a gland but terminate in the veins? And theſe veſſels being only to convey the nutritious juices, and what elſe may be a proper vehicle for them, is it not fit the circulation in them ſhould be exceeding ſlow, that the nutritious particles may adhere the eaſier to the fibres of the veſſels, which they are to augment or repair? Beſides, if any whole part was made up of blood veſſels, or any other veſſels with fluids moving ſwiftly in them, it ſeems to me impoſſible, that one part of a limb can be very cold while another part is hot, if the

the warmth of the parts is owing to the fluids they contain. And if there are ſuch veſſels as theſe, the velocity of the motion of their fluid will not depend upon any proportion they bear to the veſſels they ariſe from, but upon the velocity with which their fluids are ſeparated from the arteries into them, and the proportion of the ſections of all their orifices to the ſum of their own ſections, at any diſtance where we would compare the velocity of their fluid. And the ſtrength of the coats of theſe veſſels, may not only be as much leſs than the ſtrength of the coats of an artery, as their diameters are leſs, but alſo leſs I think in that proportion in which the velocity of their fluids is leſs, and the motions more uniform, than the velocity and motion of the blood in an artery.

The coats of the veins are much thinner than thoſe of the arteries, comparing veſſels whoſe ſections are equal, becauſe the blood moving ſlower in the veins than the arteries, it preſſes with leſs moment againſt their ſides: And beſides, the blood in the veins has nearly an equal uniform motion, but in the arteries a very unequal one, and that will require a farther difference in the ſtrength of their coats; for thoſe of the arteries muſt be equal to the greateſt natural preſſure; and if the arterial blood propels the venal, that is another reaſon for the different ſtrength of their coats.

All these things being considered, it appears to me to be an exceeding difficult thing to determine nearly, what proportion the fluids of an animal body bear to the solids, or to determine what proportion the sum of all the areas of the minutest arteries bear to the Aorta, without which I think we can neither determine the comparative velocity of the blood moving in the different vessels, nor the quantity of blood in any animal body, nor the time in which the whole mass of blood, or a quantity equal to the whole mass is flowing through the heart. But if each ventricle of the heart holds five ounces of blood, and they are filled and emptied every Systole and Diastole, which I think is true, and if eighty pulses in a minute be allowed to be a common number, there then flows twenty five pounds of blood through each ventricle of the heart in a minute. Dr. Keil has shewn that the sum of all the fluids in a man exceed the sum of all the solids, and yet the quantity of blood which all the visible arteries of a man will contain, is less than four pounds; and if we may suppose all the visible veins, including the Vena Portæ, hold four times as much, the whole then that the visible vessels can contain, is not twenty pounds; but the whole that they do contain, is but very little more than the veins can contain, seeing the arteries are always found almost empty in dead bodies,

bodies, but how much the invifible arteries and veins contain, I mean thofe which contain fuch a compound fluid, as is found in the larger veffels, I know no way to judge, unlefs we knew what proportion thefe veffels bear to thofe that carry the nutritious juices and Serum, (if there are fuch) without the Globuli of the blood.

CÆTERIS PARIBUS, is not the velocity of the blood in all animals proportionable to their quantity of action; and is not their neceffity of food alfo in proportion to their quantity of action? If fo, we may fee how it comes to pafs, that animals which ufe no exercife, and whofe blood moves extreamly flow in the winter, can fubfift without any frefh fupply of food, while others that ufe a little more exercife, require a little more food, and thofe who ufe equal exercife winter and fummer, require equal quantities of food at all times, the end of eating and drinking, being to repair what exercife and the motion of the blood has deftroyed or made ufelefs; and is not the lefs velocity of the blood in fome animals than in others, the reafon why wounds and bruifes in thofe animals do not fo foon deftroy life, as they do in animals whofe blood moves fwifter?

CHAP. X.

Of the lymphæducts.

LYMPHÆDUCTS are ſmall pellucid cylindrical tubes which ariſe inviſible from the extremities of the arteries throughout the whole body, but more plentifully in glands than other parts, and in greateſt number from ſuch glands as ſeparate the viſcideſt fluids, as may be obſerved in the liver and Teſtes. They cannot be diſcerned in a natural ſtate to have more than one coat, and that exceeding thin, having valves at ſmall and uncertain diſtances, to prevent the regreſs of their fluid. They have frequent communications like the veins, but do not unite ſo often; the larger trunks are in many places attended with ſmall glands, through which they run, and at the ſame time ſend communicant branches over them, that they might be ſecured againſt obſtructions from diſeaſes in thoſe glands. They all terminate in the Via Lactea, or in the large veins. All that riſe in the Abdomen empty into the Venæ Lacteæ Secundi Generis and Receptaculum Chyli; thoſe in the cavity of the Thorax into the Ductus Thoracicus and the ſubclavian veins. Their uſes are to carry lymph to dilute the chyle, to make it incorporate more readily with the blood (but

(but not to make it flow the better in the Lacteals, as appears sufficiently from their not entering into the minuteſt Lacteals) and to carry off ſo much lymph as is neceſſary to leave the blood in fit temper to flow through the veins; for it is always obſerved that in ſuch perſons as have their blood too thin, the Globuli cohere and form Moleculæ or polypuſes, which I imagine muſt ariſe from the Globuli of the blood not rubbing often enough, and with ſufficient force one againſt another to diſunite them as faſt as they cohere. Theſe polypuſes are frequently found in all the large veins, and in the right auricle and ventricle of the heart, eſpecially in ſuch bodies as die of chronic diſeaſes.

Authors have hitherto deſcribed and painted theſe veſſels like ſtrings of poppies, as they appear when injected with mercury; becauſe the coat of theſe veſſels being exceeding thin, it is not able any where between the valves to reſiſt the mercury's attracting it ſelf into globules: And the ſame appearance alſo happens when they are preternaturally diſtended; becauſe the valves hindering a diſtention where they are ſeated, the ſpaces between them approach to a ſpherical figure from the equal preſſure of the fluid, according to the degree of their diſtention; but in a natural ſtate when they are filled with lymph, or when they are moderately injected with air or water, they al-

ways appear as cylindrical as the veins. Any of theſe veſſels being burſt, they cauſe a dropſie in the cavity into which they open, which is oftener in the Abdomen than the Thorax. This kind of dropſie is ſometimes cured by tapping, and I believe the reaſon why it no oftner ſucceeds is, that it generally takes its riſe from a diſeaſed liver. Out of a great number that I have opened, I remember but few whoſe livers appeared perfectly ſound; one of which being very extraordinary, I will relate his caſe from his own journal. His way of life expoſing him to drink more than he thought could be conſiſtent with his health, he reſolved on a ſudden to forbear drinking any ſtrong liquors; and this being in winter time, and he catching ſome colds in ſtormy weather, he firſt became rheumatick and then dropſical; and then he came to London for a cure, October 4. 1710. He was tapped by Mr. Ferne, who took away all the water, which was about five gallons; but the Abdomen filling again very faſt, he tapped him again, October 28. November 18. December 1. December 30. January 16. and on February 17. Mr. Ferne being indiſpoſed, he was tapped by Mr. William Smith; and on February 24. by Mr. Ferne: On March 17. Mr. Ferne and my ſelf, there being a rupture at the navel, opened that with a launcet, and let out all the water that way,

and endeavoured to make a Fiſtula there to prevent future tapping, but in vain, for when the belly was emptied of water, the orifice would cloſe up, he not being able to bear a ſponge-tent to keep it open; and on March 24. 1711, we opened it again at the navel with a launcet, and on April 7. Mr. Ferne opened the navel, and again on April 22. at which time there being accidentally preſent one Mr. Spirling a barbar, who pretending to ſurgery, and having obſerved how Mr. Ferne did it, undertook to make the aperture in the ſame manner, which was by pinching up the ſkin, and cutting of it as is uſually done in making of iſſues; this was on April 30. he performed it again in about May 20. And again on June 11. but he not doing it to the captain's ſatisfaction was after this time diſcharged, and Mr. Ferne was deſired to do the operation again; but the gentleman being farther in the country than Mr. Ferne could conveniently go, I was deſired to attend him, which I did afterwards, and tapped him on June 25. July about 4. or 5. July 16. July 26. Auguſt 2. Auguſt 11. Auguſt 18. Auguſt 25. September 1. September 8. September 15. and on September 17. the water burſt out of it ſelf. I opened it again on September 27. a few days after which he died, after twenty nine times tapping and once opening it ſelf. At all which times he loſt above

feventy gallons of water. When he was firft tapped he was fo weak he could fcarce fit in a chair; but he foon gathered ftrength, went into the country, and drove himfelf in a chaife: About the feventeenth time he drove himfelf out of the country, and was tapped at my houfe, and drove himfelf home immediately after; and at other times would go out immediately after tapping. But for about three weeks before he died, he was almoft conftantly troubled with rheumatick pains, and bled frequently at the nofe, which feemed to be the moft immediate caufe of his death.

Formerly in this operation only part of the water was drawn off at a time, and the tap fometimes left in the wound to draw off more, which was exceeding painful, and fometimes brought on a mortification; and if they drew off much water at one time the patient was in great pain, and generally fainted, which was thought to proceed from the lofs of too much of the liquor at once. But Dr. Mead obferving that thefe fymptoms could not proceed from the lofs of an extravafated fluid, foon found the true caufe, which was the fudden want of the preffure of the abdominal mufcles againft the parts contained in the Abdomen; and in the year 1705. being then phyfician to St. Thomas's hofpital, ordered it to be tried there in the following manner: He directed the

the Abdomen to be preſſed by the hands of aſſiſtants while the water was running out, and afterwards kept rolled till the muſcles recovered force to do their office, and ſo took out all the water at once without any inconvenience, which has made this operation not very painful, often ſucceſsful, and never dangerous.

I OPENED a woman who died of a dropſy in the liver, in which I found the gibbous part entirely waſted, and the coat of the liver about a quarter of an inch thick which contained about five gallons of a groſs yellowiſh fluid, in which were many hydatids about the ſize of gooſeberries and ſome pieces of matter of as bright a red as vermilion. At about fourteen years of age ſhe firſt began to feel pain in this part which returned monthly, but in time grew continual, her belly conſtantly encreaſing till ſhe died, which was in the twenty eighth year of her age, without ever having had her Menſes. All the other viſcera both in the Thorax and Abdomen were perfectly ſound, nor was there the leaſt ſign of a dropſie in any of the limbs or yellowneſs in the ſkin, which is frequent in diſeaſes of the liver.

CHAP. XI.

Of the lymphatic glands.

THE glands accompanying the lymphatics, are ſituated in the three cavities, in the interſtices of the muſcles, where the lymphatics lie with the large blood veſſels, and in the four emunctories, viz. the arm-pits and groins. In the brain is ſeated the Glandula Pinealis, which I judge to be of this ſort, having often ſeen large Lymphæducts running into it from the Plexus Choroides; and at the baſis of the brain in the Sella Turcica is the Glandula Pituitaria, into which enters a large lymphatic, as I imagine, named Infundibulum, (Vid. chap. of the brain.) In the neck are ſituated a great many of theſe by the ſides of the carotid arteries and internal jugular veins, and two, or a ſort of double one upon the Larynx immediately below the thyroid cartilage, from which ſituation they derive the name of Thyroideæ, and juſt within the Thorax is ſeated another called Thymus. In very young children the Thymus is as large or larger than the thyroid glands; but in men theſe glands are very large, and the Thymus very ſmall, the former having encreaſed in about a double proportion of any other gland of this kind, and the

the latter having rather diminiſhed than encreaſed: But in brutes, ſuch as have fallen under my obſervation, it is juſt contrary. From which obſervations I am inclined to conclude, that they both belong to the very ſame lymphatics, and that either of them encreaſing as much as both ought to do if both encreaſed, anſwers the ſame end as if both did; and that the reaſon why the Thymus encreaſes rather than the thyroid glands in brutes, is becauſe the ſhape of their Thorax affords convenient room for it to lodge in; and that in men the thyroid glands encreaſed ſo much becauſe there is no room in that part of the Thorax where the Thymus is ſeated for a large gland to be lodged. In dogs, a porpuſs, and ſome other animals, I have ſeen the lymphatics in the Thymus and between the Thymus and Ductus Thoracicus full of chyle, and ſo in many other lymphatics near the Via Lactea. Under the baſis of the heart, and at the ſides of the lungs, where the great veſſels enter, are many of theſe glands from the ſize of a pea to that of a hazel nut. In the Abdomen upon the loins near the kidneys, and by the ſides of the iliac veſſels are many of theſe glands, which are called Lumbales, and there are ſome at the hollow ſide of the liver, named Hepaticæ: And the meſentery is full of glands of a like appearance, but they ſeem to belong only to the

the lacteal veins, unlefs fome of them which are feated at the Bafis of the mefentery among the Venæ Lacteæ Secundi Generis, belong to the lymphatics that come from the liver, where the hepatic lymphatics pafs in their way to the Receptaculum Chyli. The glands which accompany the blood veffels in the limbs are few, and diftributed in no certain order; except thofe in the four emunctories, i. e. in the arm-pits and groins, named Axillares and Inguinales.

Brutes have fome large ones in the thigh, commonly called the pope's-eye; thefe are feated about the great veffels in the thigh, where they pafs through the Triceps mufcle. From this fituation, and not from any thing extraordinary in thefe glands it is that wounds are there fo dangerous. The lymphatick glands are faid by Nuck and others after him, to be compofed of veficles, and not of veffels like other glands; and that thefe veficles are repofitories of lymph: But from their appearance in a natural ftate which is very compact and uniform, there feems to me to be but little reafon for fuch a conjecture. Some have thought their ufe to be by contracting to accelerate the motion of the fluid in the lymphatics; but that does not feem very probable, becaufe a mufcular coat would have been the readieft means to produce that effect; befides, thefe veffels feldom enter

any of them without detaching a branch over at the ſame time perhaps to prevent obſtructions. And if theſe glands were endued with a contracting power, which is only preſumed without any proof, it would ſtill be difficult to conceive how ſuch a power applied at uncertain ſpaces, ſhould not rather obſtruct than accelerate the motion of lymph in the lymphatics, unleſs there were valves to prevent a reflux; and even then, if this were a convenient piece of mechaniſm, it would be very ſtrange, it ſhould no where elſe in the body be made uſe of.

CHAP. XII.

Of the courſe of the aliment and fluids, abſtracted from the foregoing chapters.

THE aliment being received into the mouth is there maſticated by the teeth, and impregnated with Saliva, which is preſſed out of the ſalivary glands by the motions of the jaw and the muſcles that move it and the tongue. (See from page 151 to page 158.)

THEN it deſcends through the Pharynx into the ſtomach, where it is digeſted by the

juices of the ſtomach, (which are what is thrown out of the glands of its inmoſt coat, and Saliva out of the mouth) and a moderate warmth and attrition. (See from page 161, to page 166.

THEN it is thrown through the Pylorus or right orifice of the ſtomach into the Duodenum, where it is mixed with bile from the gall-bladder and liver, and the pancreatic juice, from the pancreatic gland. Theſe fluids ſerve further to attenuate and dilute the digeſted aliment, and probably, to make the fluid part ſeparate better from the Fæces. After this it is continually moved by the periſtaltic or vermicular motion of the guts, and the compreſſion of the diaphragm and abdominal muſcles, by which forces the fluid parts are preſſed into the lacteals, and the groſs parts through the guts to the Anus. (See from page 166, to page 168, and from 176, to page 181.)

THE chyle, or thin and milky part of the aliment, being received into the lacteals from all the ſmall guts, they carry it into the Receptaculum Chyli, and from thence the Ductus Thoracicus carries it into the left ſubclavian vein, where it mixes with the blood, and paſſes with it to the heart. (See from page 182, to page 187.)

ALL the veins being emptyed into two branches, viz. the aſcending and deſcending Cava, they empty into the right auricle of the heart;

heart; the right auricle unloads into the right ventricle, which throws the blood through the pulmonary artery into the lungs; from the lungs, the blood is brought by the pulmonary veins into the left auricle, and from that into the left ventricle, by which it is thrown into the Aorta, and diſtributed through the body. From the extremities of the arteries ariſe the veins and lymphatics, the veins to collect the blood and bring it back to the heart, and the lymphatics to return the lymph or thinner part of the blood, from the arteries, to the veins and the Via Lactea, where it mixes with the chyle, and then paſſes with it into the left ſubclavian vein and to the heart. (See from page 193, to page 232.)

All the fluids that paſs into the ſtomach and guts being carried into the blood-veſſels, the greateſt part of them are ſeparated and carryed off by proper veſſels, viz. urine from the kidneys, bile from the liver, &c. and theſe juices carry along with them whatever might be injurious to the animal œconomy. (See from page 182, to page 187.

CHAP.

CHAP. XIII

Of the Dura Mater and Pia Mater.

DURA MATER, is a very compact ſtrong membrane lining the inſide of the ſcull, firmly adhering at its baſis, and but lightly at the upper part, except at the ſutures. It has three proceſſes: The firſt named Falx, begins at the Criſta Galli, and runs backwards under the Sutura Sagittalis to the Cerebellum, dividing the Cerebrum into two hemiſpheres. Its uſe is ſaid to be, to ſupport one ſide of the Cerebrum from preſſing on the other when the head is inclined to one ſide. But I think it is evident that this is not the uſe, becauſe there would be more need of ſuch a proceſs from one ſide of the ſcull to the other, than this way; and it would be alſo very neceſſary that it ſhould run through the brain, to anſwer that end. The principal uſe appears to me to be to divide the brain into ſuch portions as are leaſt liable to be moved in the ſcull, by any violent motions of the head, which is better done this way than it would the other; and the under-ſide of the brain is kept ſteddy by the inequalities of the baſis of the ſcull, which the brain is exactly fitted to. In brutes the Falx is always very ſmall, therefore in thoſe whoſe brains are of the larger ſize, as

as oxen, ſheep, horſes, &c. the upper part of the ſcull is made uneven, exactly to fit the folds of the brain, which ſecures the upper parts of their brains from concuſſions, in the ſame manner that the lower parts are ſecured. The ſecond proceſs runs from the lower and back-part of the former to the upper edge of each Os Petroſum, and ſuſtains the poſterior lobes of the Cerebrum, that they might not compreſs the Cerebellum. In ſuch rapacious animals as I have diſſected, this proceſs is bone. The third is very ſmall; it runs from the laſt deſcribed proceſs down towards the great Foramen of the ſcull, and poſſeſſes the ſmall ſpace in the Cerebellum between the Proceſſus Vermiformis. Theſe proceſſes of the Dura Mater alſo ſerve to keep the brain ſteddy.

The Dura Mater has in it ſeveral ſinuſes, which are large veins to receive the blood from the leſſer veins of the brain: Their number is uncertain, and thoſe that are conſtant are not deſcribed in the ſame order by writers. The firſt that preſents it ſelf is the Longitudinalis Superior, running from a blind hole a little above the Criſta Galli all along the upper edge of the Falx. A tranſverſe ſection of this veſſel is not circular, like other veſſels, but a triangle whoſe ſides are arches of a circle; the upper ſide convex outwards, and the two lower convex inwards. The figure of this veſſel, is preſerved

preſerved by ſmall ligaments running acroſs in the inſide that it might not become conical, or cylindrical, like other veſſels, from the equal preſſure of the contained blood, and thereby incommode the upper edges of each hemiſphere of the Cerebrum. On the lower edge of this proceſs is generally another very ſmall one, called Longitudinalis Inferior; this runs into the Rectus, and when wanting is ſupplied by a vein; Rectus runs between the two firſt proceſſes of the Dura Mater, and unloads with the Sinus Longitudinalis Superior into the two lateral ſinuſes; but for the moſt part the longitudinal Sinus goes more directly into one of the lateral ſinuſes, and the ſtreight Sinus into the other. There is ſometimes a ſmall one in the third proceſs, which empties in the ſame place with the former. From the endings of the longitudinal and ſtreight ſinuſes, begin the two lateral ſinuſes, which when they come to the Os Petroſum, dip down and paſs through the eighth Foramina into the internal jugular veins. There is another named Circularis, it runs round the fore-part only of the Sella Turcica; the two ends of this empty into four ſinuſes, one on the top of each Os Petroſum, which paſs into the Sinus Laterales, and one at the under ſides of the ſame bones, which paſs indifferently into both the lateral and cervical ſinuſes; theſe two laſt ſinuſes have always

ways communicant branches. The cervical ſinuſes run from the baſis of the ſcull through the great Foramen on both ſides the Medulla Spinalis Colli, and through the tranſverſe proceſſes of the cervical Vertebræ; the laſt of theſe have many times proper Foramina running from the eighth Foramina to the back-part of the Apophyſes of the occipital bone. There are alſo two more of theſe veſſels, which run from the circular Sinus between the Os Sphenoides and fore-part of the Os Petroſum directly into the internal jugular veins.

PIA MATER, is an exceeding fine membrane immediately inveſting the brain even between its lobes, hemiſpheres and folds. It ſerves to contain the brain, and ſupport its blood-veſſels, which run here in great numbers, for the arteries to divide into ſmall branches upon, that the blood contained may not enter the brain too impetuouſly; and for the veins to unite on, that they may enter the ſinuſes more conveniently. Between the Dura and Pia Mater, is deſcribed by ſeveral anatomiſts, a membrane called Arachnoides, which may eaſily be ſhewn at the back-part of the Cerebrum, upon the Cerebellum and back-part of the Medulla Spinalis.

I HAVE once ſeen a large part of the Dura Mater, and once part of the Pia Mater oſſified.

CHAP. XIV.

Of the Cerebrum, Cerebellum, Medulla Oblongata and Medulla Spinalis.

CEREBRUM, is that part of the brain which poſſeſſes all the upper and fore-part of the Cranium, being ſeparated from the Cerebellum by the ſecond proceſs of the Dura Mater. Its upper ſide is divided into two hemiſpheres, and its lower ſide into four lobes, two called anterior and two poſterior, which latter are much the largeſt. At the meeting of the four lobes, appears the Infundibulum, which ſeems to be a lymphatick running from the ventricles of the brain into the Glandula Pituitaria. This gland is ſeated in the Sella Turcica. Immediately behind the Infundibulum appear two ſmall bodies, named Protuberantiæ Duæ Albæ Pone Infundibulum. Between the two hemiſpheres of the Cerebrum, lower than the circumvolutions, appears a white body named Corpus Calloſum. Under the Corpus Calloſum, appear the two lateral or ſuperior ventricles, which are divided into right and left by a very thin membrane, named Septum Lucidum, which is extended between the Corpus Calloſum and Fornix. The Fornix is a medullary body, beginning from the fore-part of theſe

theſe ventricles, with two ſmall roots which ſoon unite; and running towards the back-part, where they divide into two parts, called Crura Fornicis. In the baſis of theſe two ventricles, are four prominences: The two anterior are called (becauſe of their inner texture) Corpora Striata; the other two are named Thalami Nervorum Opticorum. Beyond theſe, are two more proceſſes, called Nates: And under them, nearer the Cerebellum, two called Teſtes. Above the Nates, is ſituated the Glandula Pinealis, famous for being ſuppoſed by Des Cartes, the ſeat of the ſoul. And upon the Thalami Nervorum Opticorum, are a number of blood-veſſels, glands, and lymphæducts, called Plexus Choroides. Under the beginning of the Fornex, is a ſmall Foramen called Foramen ad Radices Fornicis, or Iter ad Infundibulum. And under the middle of the Fornix, one called Foramen Poſterius, which is covered with a valve named Membrana or Valvula Major; and the ſpace under the two anterior ventricles between the Foramina and the Cerebellum, is the third ventricle.

Cerebellum, is ſituated under the ſecond proceſs of the Dura Mater. By dividing this part of the brain length-ways, we diſcover more plainly the fourth ventricle, whoſe extremity is called Calamus Scriptorius; here alſo appear two medullary bodies called Pe-

dunculi, which are the basis of the Cerebellum. The medullary part in the Cerebellum, though it is inmost, as in the Cerebrum, yet is of a different shape, being branched out like a plant.

The substance of the brain is distinguished into outer and inner; the former is called Corticalis, Cinerea, or Glandulosa, the latter Medullaris, Alba, or Nervea.

MEDULLA OBLONGATA, is a medullary production from the under part of the Cerebrum and Cerebellum: It first appears in two bodies from the anterior part of the posterior lobes of the Cerebrum, called Crura Medullæ Oblongatæ. The union of these Crura between the Cerebrum and Cerebellum, is called Isthmus; and immediately beyond this, is an eminence, named Processius Annularis.

MEDULLA SPINALIS, is a production of the Medulla Oblongata through the great Foramen of the scull, and through the channel of the spine: It enlarges about the last Vertebræ of the back, and first of the neck, where the large nerves are given off to the arms; it again enlarges in the loins, where the crural nerves begin; and the lower end of it with those and other nerves, is called from its resemblance Cauda Equina. The coats of this part are the same with those of the brain; but the membrane here, which is analogous

analagous to the Dura Mater, is thinner and more connected to the bones, and the Tunica Arachnoides more confpicuous.

WOUNDS in the Cerebrum, though very dangerous, are not mortal; but in the Cerebellum and Medulla Oblongata, they caufe fudden death; and in the Medulla Spinalis, lofs of fenfe in all the parts which receive nerves from below the wound. In perfons that have died lethargic, I have always found the brain full of water; and in children the brain is always very foft and moift. In a man that died of an apoplexy I found all the veffels of the brain immoderately diftended with blood, and the ventricles and the fubftance of the brain full of lymph, and the Pia Mater very much thickened, and adhering fo very loofely, that the greateft part of it was feparated without breaking.

I HAVE twice feen in the Cerebrum a fchirrous tumour as large as a pullet's egg; and in another body, impofthumations which poffeffed near two thirds of the whole Cerebrum. And in a perfon that died with a Gutta Serena, I found all the ventricles of the brain full of lymph; and the Thalami Nervorum Opticorum and the optick nerves, e'er they went out of the fcull, made flat with the preffure. And in an old man I found the right optick nerve wafted, and black.

CHAP. XV.

Of the nerves.

" FRom the medullary part of the Cerebrum, Cerebellum, and Medulla Spinalis, a vaſt number of ſmall medullary white " fibres are ſent out, which, at their firſt egreſs, " ſeem eaſily to ſeparate, but as they paſs forward are ſomewhat more, but ſtill looſely " connected, by the coat which they obtain " from the Pia Mater, and at laſt piercing the " Dura Mater, are ſtraitly braced by that membrane which covers them in their progreſs; " whence they become white, firm, ſtrong " cords, and are ſo, well known by the name " of nerves. To theſe coats an infinite number of veſſels, both arteries and veins are " diſtributed; ſo that after a nice, lucky injection the whole cord is tinged with the colour " of the injected liquor; but when the fibrils " are examined, even with the beſt microſcope, " they appear only like ſo many ſmall diſtinct " threads running parallel, without any cavity " obſervable in them, though ſome incautious " obſervers, miſtaking the cut orifices of the " arterious and venous veſſels, juſt now mentioned, for nervous tubes, have affirmed " their cavities to be viſible. The nerves, which " if

" if all joined, hardly make a cord of an inch
" diameter, would ſeem from their exert-
" ing themſelves every where, to be diſtri-
" buted to each, even the ſmalleſt part of
" the body. In their courſe to the places for
" which they are deſtined they generally run
" as ſtrait, as the part over which they are to
" paſs, and their own ſafety from external
" injuries will allow, ſending off their branches
" at very acute angles, and conſequently run-
" ning more parallel than the blood veſſels.
" Their diſtribution is ſeldom different in the
" oppoſite ſides of the ſame ſubject, nor in-
" deed in any two ſubjects is there conſi-
" derable variety found. Frequently nerves
" which come out diſtinct or ſeparate, after-
" wards conjoin into one Faſciculus, under the
" ſame common covering; and though the
" nervous fibrils probably do not communi-
" cate, (the Reaſon of which opinion ſhall
" immediately be given) yet becauſe the coats,
" at the conjoined part are common, and theſe
" ſtrong coats may have great effects on the
" ſoft pulpy nerves, it is evident all ſuch will
" have a conſiderable ſympathy with one ano-
" ther, whereof ſeveral examples in practice
" ſhall be inſtanced when the particular nerves
" are deſcribed. In ſome parts where there
" are ſuch conjunctions, the bulk of the nerves
" ſeems much increaſed, and theſe knotty

" oval bodies, called by Falloppius Corpofa O-
" livaria, and generally now named ganglions,
" are formed; the coats of thefe knots are
" ftronger, thicker, and more mufcular, than
" the whole nerves which enter into them
" would feem to conftitute, while the nervous
" fibrils pafs through without any great al-
" teration or change. I do not think any au-
" thor has yet made a probable conjecture of
" the ufe or defign of thefe ganglions, whe-
" ther they imagine them Corcula Expellen-
" tia, refervoires, or elaboratories, neither
" can I give an account of their ufe the leaft
" fatisfactory to my felf.

" From undeniable evident experiments,
" all anatomifts are now convinced that to the
" nerves we owe all our fenfation and motion,
" of which they are the proper organs; and
" the fenfations in the minuteft parts being
" very diftinct, therefore the inftruments of
" fuch fenfations muft have diftinct origins
" and courfe to each part. Though all are a-
" greed as to the effect, yet a hot difpute has
" arofe about the manner how it is produced,
" viz. whether fenfation and motion are occa-
" fioned by a vibration communicated to the
" nerves, which thefe gentlemen fuppofe en-
" tirely folid and tenfe, or by a liquid con-
" tained and moved in them. The laft of thefe
" opinions I rather incline to for thefe reafons,

" becaufe

" because the nerves proceeding from the brain
" bear a great analogy to the excretory ducts
" of other glands. Then they are far from be-
" ing stretched and tense in order to vibrate:
" And what brings the existence of a liquid in
" their cavities next to a demonstration, is the
" experiment first made by Bellini, and related
" by Bohn and Pitcairn, which I have often
" done with exact good success; it is this:
" After opening the Thorax of a living dog,
" catch hold of and compress the phrenick
" nerve, immediately the diaphragm ceases to
" act; remove the compressing force, that mu-
" scle again contracts; gripe the nerve with
" one hand some way above the diaphragm,
" that Septum is unactive; then with the other
" hand strip down the nerve from the first
" hand to the diaphragm, this muscle again
" contracts; after once or twice having strip-
" ped the nerve thus down, or exhausted the
" liquid contained in it, the muscle no more
" acts, squeeze as you will, till the first hand is
" taken away or removed higher, and the
" nerve stripped, i. e. the liquids in the superior
" part of the nerve have free access to the
" diaphragm, or are forced down to it, when
" it again will move. Now if this liquid should
" be granted us, I am afraid we shall be still
" as much at a loss to account for sensation
" and motion as ever; and therefore all I shall

" assume is what is founded on experiments, " that these two actions do depend on the " nerves; that sensations are pleasant as long " as the nerves are only gently affected with- " out any violence offered them; but as soon " as any force applied goes beyond this, and " threatens a solution of union, it creates that " uneasy sensation pain; that the nerves, " their source, or their coats being vitiated " either convulsion or palsy of the muscles " may ensue.

" The nerves are distinguished into two " classes, of the Encephalon and Medulla Spi- " nalis; of the first there are generally ten pair " reckoned, of the last thirty. I shall describe " the nerves in the same order in which they " are generally ranked, though it is not pos- " sible to prosecute the dissection of them af- " ter the same manner; but to supply this, " I shall mention also the order wherein they " may be all demonstrated on one subject. " When I assign the origin of any nerve from " any particular part, I desire it may be un- " derstood of that part of the surface of the " Medulla where the nerve first appears; for " by this method we will shun any dispute " with those authors who trace their rise too " minutely, and perhaps be less liable to mis- " take or to deceive our readers. Nor shall I " be over anxious about the terminations of

" the

" the Minimæ Fibrillæ, ſince it is not poſſi-
" ble to trace them Ad Ultimos Fines, nor
" do I think very neceſſary for explaining any
" Phænomena, while very often in a multipli-
" city of words, the whole deſcription comes
" to be obſcure or unintelligible.

" Of the ten pair proceeding from the En-
" cephalon, the firſt is the olfactory, which in
" brutes, juſtly enough, has the name of Pro-
" ceſſus Mammillares beſtowed on them, be-
" ing large and hollow, and are indeed evi-
" dently the two anterior ventricles of the
" brain produced; which ſtructure, and the
" lymph conſtantly found in them, induced
" the antients to believe that they ſerved as
" emunctories to convey the ſuperabundant
" Mucus from the cold moiſt brain to the noſe;
" but in man they are ſmall, long, and with-
" out any cavity, riſing from that part of the
" brain where the carotid arteries are about
" to enter, and running under the anterior
" lobes of the brain become a little larger, till
" they reach the Os Cribriforme, into the Fo-
" ramina, of which the ſmal filaments inſinuate
" themſelves, as upon gently pulling thoſe
" nerves or after having cut them very near the
" bone is evident, and are immediately ſpread
" on the Membrana Narium. Their tender ſtruc-
" ture and ſudden expanſion on ſuch a large
" ſurface, make it impoſſible to trace them on
" the

" the membrane of the noſtrils, which has " given ſome handle to ſeveral authors to de- " ny them the ſtructure or uſe to nerves.

" The ſecond are the optick, which ariſe ſin- " gle from the Thalami Nervorum Opticorum, " and then uniting at the fore part of the Cel- " la Turcica, they ſeem to be pretty much " blended; afterwards they divide, and run- " ning obliquely forwards, paſs out at their " proper hole of the ſphenoide bone, and en- " ter the globe of the eye to be expanded into " the Membrana Retina. From this conjuncti- " on of theſe nerves, authors generally endea- " vour to account for our ſeeing objects ſingle, " whereas we have reaſon to believe fiſhes, " the chameleon, &c. whoſe optick nerves " ſimply croſs one another without any ſuch " union, do ſee objects alſo ſingle, ſince they " ſo exactly ruſh on their prey; whereas if " thoſe authors aſſertions were true, they " would oftener catch at the ſhadow than the " ſubſtance. The blood veſſels running through " the middle of theſe nerves, and the ramifi- " cations of the Retina are very obſervable, " whence we may deduce the reaſon of Picard's " experiment of ſuch objects as fall on the en- " try of the optick nerve being loſt to us, and " hence alſo an account may be given of an " Amauroſis or Gutta Serena.

The

" The third pair of nerves firſt appear at " the anterior part of the Proceſſus Annularis, " and going out at the Foramen Lacerum are " diſtributed to the globe of the eye; Muſcu- " lus Rectus Fallopii, Attollens, Adducens, " Deprimens, and Obliquus Minor; there- " fore this pair has juſtly got the name of " Motores Oculi.

" The fourth pair, which are the ſmalleſt of " any, derive their origins from the anterior la- " teral part of the Proceſſus Annularis, and go " out at the Foramina Lacera to be entirely " ſpent on the Muſculi Trochleares, or Obliqui " Majores Oculorum, to which muſcles chiefly " the rotatory motion of the eyes in ogling " and the advance of the eyes forward in ſta- " ring, and fury, is owing; for which reaſon " anatomiſts have called theſe nerves Pathe- " tici.

" The fifth pair riſe from the ſides of the annu- " lar proceſs, and after piercing the Dura Mater " divide into three branches; the firſt of which is " the Opthalmick, which as it is about to enter " the orbit by the Foramen Lacerum, ſends off " a ſmall twig that aſſiſts in the formation of " the intercoſtal, and then the nerve is diſtri- " buted to the Glandula Lacrymalis, fat, mem- " branes, and Palpebræ of the eye, while it " ſends one conſiderable branch through the " Orbiter Internus Anterior hole to be loſt in

" the

" the Membrana Narium, and a ſecond paſſes
" the Foramen and Supercilia to ſupply the
" muſcles and teguments of the forehead.
" Hence we eaſily diſcover what part is affect-
" ed in that painful diſeaſe the megrim, when
" the eye-ball and forehead are racked, and
" ſuch a heat is felt within the noſe: Hence alſo
" we may learn how the muſcles of reſpiration
" come to be ſo much affected on the applica-
" tion of any acrid irritating ſubſtance to the
" Membrana Narium, as to produce that vio-
" lent convulſive motion, ſneezing. The ſe-
" cond branch of the fifth pair, which may be
" called Maxillaris Superior, paſſes out through
" the Foramen Rotundum Oſſis Sphenoidis,
" and immediately gives nerves to the fat un-
" der the crotaphyte muſcle, and to the pa-
" late, Sinus Sphenoidalis and noſtrils. The
" remaining trunk inſinuating it ſelf into the
" channel on the top of the Antrum Highmo-
" rianum, to which cavity and to the teeth
" of the upper jaw it gives ſmall twigs, at laſt
" comes out at the Orbiter Externus hole, and
" is ſpent on the Muſculus Orbicularis Palpebra-
" rum, noſe and upper lip, where ſome branches
" of the ſeventh pair ſeem to unite themſelves
" to the twigs of this. The third branch or
" Maxillaris Inferior goes out at the Foramen
" Ovale, or fourth hole of the wedg-like bone,
" and ſoon ſplitting into a great many bran-
" ches

" ches, is diſtributed to the Muſculus Crota-
" phites, Maſſeter, Pterygoides, Digaſtricus,
" Buccinator, Mylohyoideus, Geiniohyoideus,
" Genio-gloſſus and Baſio-gloſſus , Glandula
" Sublingualis, Maxillaris Inferior, and Paro-
" tis, to the external ear where it ſeems to
" join the Portio Dura; to the ſubſtance of
" the tongue in which it is pretty much con-
" founded with the ninth pair: From the root
" of this laſt branch the Chorda Timpani is
" reflected. The laſt ramification of this branch
" which I ſhall mention, is that which enters
" into the canal of the lower jaw, furniſhes the
" teeth there, and comes out at the chin, on
" which and the lower lip it is beſtowed; at
" this place it is again conjoined to the ſeventh
" pair. From this ſhort ſketch of the large
" fifth pair of nerves, and by obſerving ſeveral
" Phænomena which happen to thoſe parts to
" which they are diſtributed, we might have
" a much farther confirmation of the general
" doctrine of nerves delivered, and ſee, at
" leaſt, the way pathed to a rational account
" of theſe Phænomena, for reaſoning of which
" we ſhould not otherwiſe have the leaſt ground.
" We can, for example, from the Chorda Tym-
" pani and the nerves of the teeth being de-
" rived from the ſame common trunk, under-
" ſtand how the ſound of any vibrating body
" held between our teeth is ſenſible to us,
" when

" when another cannot poſſibly hear the leaſt
" on't. By the like rule we know why in a vi-
" olent tooth-ach the muſcles of the face are
" ſometimes convulſed; nor ſhall we be ſur-
" prized to hear one plagued with the ach in
" his upper teeth, complain of a gnawing pain
" deep ſeated in the bones of his face, or to
" ſee his eye-lids much ſwelled, or the tears
" trickling down in great abundance; whereas
" the lower teeth aching, the ear is pained,
" and the Saliva flows in great quantities. We
" may have ſome diſtant views of ſome foun-
" dation in reaſon for the cure of the tooth-ach,
" by ſtrong compreſſion of the chin, or by
" applying bliſters behind the ears, or by burn-
" ing behind or on the ear. Among a great
" many inſtances of the good effect of the ac-
" tual cautery in ſuch a caſe, I ſhall give one
" which ſeems to me remarkable. I. M. was
" ſeized with the tooth-ach, a convulſion of
" that whole ſide of his face followed whenever
" the pain became acute, or he attempted
" to ſpeak; after he had undergone blooding,
" purging, ſalivation, ſetons, &c. without any
" benefit, he was cured by applying a ſmall
" cauteriſing iron to the Antihelix.

" The ſixth pair of nerves ariſing from
" the fore part of the Corpora Pyramidalia,
" after piercing through the Dura Mater, give
" off a branch, which joined with the reflect-

" ed

" ed twig of the the ophthalmick branch of
" the fifth pair, forms the original of the in-
" tercoſtal, paſſes through the Foramen Lace-
" rum to be ſpent entirely on the Muſculus
" Abductor Oculi; ſuppoſing this nerve to
" ſupply ever ſo little leſs than a due propor-
" tion of Liquidum Nervoſum, an involuntary
" Strabiſmus will be occaſioned.

" Though the fifth and ſixth pair of
" nerves form entirely the beginning of the
" intercoſtal before it goes out of the ſcull, yet
" becauſe ſeveral other nerves contribute to-
" wards the formation of its trunk before it
" ſends off any branches, I ſhall ſuperſede the
" deſcription of it till the original nerves are
" ſpoke to.

" The ſeventh pair appears coming out
" from the ſide of the root of the annular
" proceſs, and entering the Meatus Audito-
" rius Internus, and immediately dividing one
" part, ſoon loſes its firm coats, and is ex-
" panded on the inmoſt Camera of the ear,
" while the other paſſing through the Aquæ-
" ductus Fallopii comes out of the ſcull in-
" volved in all its coats between the ſtyloide
" and maſtoide proceſſes; whence we ſee the
" reaſon of the firſt being named Portio Mol-
" lis, and the other Dura: This laſt after its
" exit ſupplies the Muſculi Obliqui Capitis
" Stylohyoidei, Styloglosſi and Stylopharyngei,

" and Platyſma Myoides, on which and to the " ſkin of the neck, a great number of its " ſmall filaments run, which are ſometimes " cut in opening the jugular vein, whence " pain at firſt, and a little numbneſs after- " wards. The ſuperior branches of it ſupply " the parotid gland, external ear and whole " ſide of the face as far forwards as the chin. " It is ſaid to communicate thrice with the " fifth pair, and twice with the ſecond verte- " bral. Whether may not we hence ſee ſome " reaſon why the head is ſo ſoon moved by " the impreſſion of ſound on our ear?

" THE eighth pair of nerves derive their " origin from the ſide of the baſis of the Cor- " pora Olivaria, where their looſe filamentous " texture is very conſpicuous; then running " to the hole common to the Oſſa Temporum " and Occipitis, they are there joined by the " Acceſſorius Williſii, which has its beginning " from the two or three ſuperior nerves of " the Medulla Spinalis, and mounts upwards " thither, to paſs out with the eighth pair, at " that common Foramen juſt now mentioned: " Very ſoon after they, wrapped up in the ſame " coat, have got out of the Cranium, the Ac- " ceſſorius ſeparates from its companion, and " after paſſing through the middle of the " Muſculus Maſtoideus is loſt in the Muſculus " Trapezius and Rhomboides Scapulæ. While

" the large trunk, which from the great num-
" ber of branches it ſends off obtains the name
" of Vagus, runs ſtrait down the neck, near
" the carotid artery, in its courſe giving ſeveral
" branches to the Larynx: When entered the
" Thorax it ſplits into two; the anterior ſerves
" the Pericardium, ſends branches to join with
" thoſe of the intercoſtal that go to the heart,
" and then on the right ſide turns round
" the ſubclavian, and on the left round the
" great curvature of the Aorta to mount again
" upwards at the ſide of the Œſophagus to be
" loſt in the Larynx. This recurrent branch it
" is that we are earneſtly cautioned to avoid in
" Bronchotomie, though by reaſon of its deep
" ſituation we are in no hazard of it. If both
" theſe nerves were cut, it is probable the voice
" would not be entirely loſt as long as the ſu-
" perior branches ſtill ſupply the Larynx. The
" poſterior branch of the eighth pair goes a-
" long with the Œſophagus, and ſupplies the
" lungs, the Gula and ſtomach very plentiful-
" ly: And as all the nerves beſtowed on this
" Viſcus enter at the ſuperior orifice of it, the
" ſenſation here muſt be very acute; whence
" Helmont imagined the mouth of the ſtomach
" to be the ſeat of the ſoul. What remains of
" this Par Vagum is adjoined to the intercoſ-
" tal immediately below the diaphragm.

" The ninth pair appears firſt at the inferi-
" or part of the Corpora Pyramidalia, and
" march out at their proper holes of the Occi-
" pitis, and after ſending off ſome nerves to
" the Glandula Thyroidea, and Muſculi Ster-
" no-Hyoidei, and Sterno-Thyroidei, are loſt
" in the ſubſtance of the tongue. Authors
" have diſputed whether this ninth or the fifth
" is the guſtatory nerve; the old opinion in fa-
" vour of the ninth is to me moſt probable, be-
" cauſe the fifth is no where elſe employed as
" an organ of ſenſation, becauſe the ninth ſeems
" to penetrate the ſubſtance of the tongue more,
" while the fifth is ſpent on the muſcles.

" The tenth pair comes out from the begin-
" ning of the Medulla Spinalis betwixt the Os
" Occipitis and firſt Vertebra Colli, and is all,
" except what goes to the ganglion of the in-
" tercoſtal, ſpent on the Muſculi Obliqui, and
" Extenſores Capitis.

" The only nerves proceeding from the
" Encephalon not deſcribed, are the reflected
" branches of the fifth and ſixth, which indeed
" are ſo ſmall and pappy, and hid by the ca-
" rotid artery as they go out with it in its
" crooked canal, as not to be eaſily traced, but
" whenever they have eſcaped from the Os
" Petroſum they are joined by branches from
" the eighth, ninth, tenth; and firſt and ſecond
" ſpinal, and the largeſt ganglion of the body

" is

" is formed, from which the nerve named now
" intercoſtal goes out to deſcend down the
" neck with the carotid, ſupplying in its courſe
" the Muſculi Flexores of the head and neck,
" and communicating with the cervical nerves.
" As the intercoſtal is about to enter the Tho-
" rax, it again forms a ganglion, from which
" nerves to the Trachea Arteria and the
" heart are ſupplied, which join with the bran-
" ches of the eighth, and paſs between the two
" large arteries and auricles to the ſubſtance
" of that muſcle. Now let any one conſider the
" egreſs of the intercoſtal, and cloſe courſe of
" it and the eighth with the carotid artery,
" and this manner of entry of the cardiac nerves,
" ſurely the alternate conſtriction and relaxa-
" tion of the heart will appear neceſſarily de-
" pending on the diſpoſition of theſe organs
" of motion, the nerves. The intercoſtal after
" this runs down on the ſide of the Vertebræ
" Thoracis, having additional nerves conſtant-
" ly ſent to it from between theſe Vertebræ,
" till it paſs through its own proper hole of
" the diaphragm; whence it again forms ano-
" ther ganglion cloſe by the Glandulæ Renales,
" into which the eighth pair enter. From ſuch a
" knot on each ſide, the nerves of the guts, liver,
" ſpleen, Pancreas and kidneys are derived,
" nay the extremity of this nerve is ſent down
" to the Pelvis to ſupply the parts there. Hence

" the great ſympathy of theſe parts may be ea-
" ſily deduced, and a reaſon may be given of
" the violent vomiting that commonly attends
" a Nephritis, and of the belching cholicks
" and ſtomach-achs, which often enſue on the
" obſtructions of the Menſtrua.

" Before I proceed to the ſpinal nerves,
" I ſhall ſet down the order in which theſe
" nerves already deſcribed, are to be diſſected
" in order to demonſtrate them all in one ſub-
" ject, but to them muſt aſſume the three firſt
" cervical nerves, the reaſon of which will be
" evident afterwards.

" Portio Dura ſeptimi, Frontalis quinti,
" Facialis quinti, Mentalis quinti, Spinalis ſe-
" cundus, Spinalis primus, Olfactorius, Oph-
" thalmicus quinti, Motorius Oculi, Patheti-
" cus ſextus, Opticus, Maxillaris inferior quin-
" ti, Maxillaris ſuperior quinti, Acceſſorius
" Williſii, nonus, decimus, octavus Intercoſ-
" talis, Portio Mollis ſeptimi.

" The thirty pair of nerves proceeding
" from the Medulla Spinalis, are generally
" divided into four ſpecies, of the neck ſeven,
" of the back twelve, of the loins five, and of
" the Os Sacrum ſix. Now as the Medulla
" Spinalis has none of theſe inequalities ſo ob-
" ſervable on the Medulla Oblongata Ence-
" phali, the riſe of the nerves is not ſo accu-

" rately

" rately deſcribed, being only determined by
" the bones through which they paſs.

" The firſt cervical goes out between the
" firſt and ſecond Vertebra, and, after ſending
" off branches that communicate with the tenth
" and ſecond Vertebrale, is ſpent on the Muſ-
" culus Flexus Colli, Splenius, Complexus, and
" teguments of the Occipitis.

" The ſecond cervical communicates with
" the ninth, and with the firſt and third of the
" neck, and then is diſtributed to the Tegu-
" ments of the neck and ſide of the head, and
" to the Glandula Parotis and external ear,
" where it joins with the Portio Dura.

" The third of the neck paſſes out be-
" tween the third and fourth Vertebra, ſoon
" communicating with the ſecond, and ſend-
" ing down a large branch, which being joined
" by another from the fourth forms the phre-
" nick nerve that runs along the Pericardium
" to be loſt in the diaphragm. In this courſe
" the right phrenick is obliged to make a ſmall
" turn round that part of the Pericardium
" which covers the Apex of the heart. Hence
" it is, that ſuch as have ſtrong palpitations
" of the heart, feel a pungent acute pain im-
" mediately above the right orifice of the ſto-
" mach. The other branches of this third cer-
" vical are diſtributed to the Muſculus Trape-
" zius and Deltoides, and to the teguments

" on the top of the ſhoulder; which, with the
" deſcription of the eighth pair, leads us evi-
" dently to the reaſons of the divine Hippo-
" crates's obſervation, that an inflammation
" of the liver is generally attended with a
" hickup, and a ſuppuration of that Viſcus with
" a violent pain on the top of the ſhoulder.
" However we are not hence to conclude ſo
" generally as I have obſerved phyſicians fre-
" quently do, that if the Hypochondria are af-
" fected, and this pain of the ſhoulder is felt,
" therefore the liver is ſuppurated, for any
" other cauſe ſtimulating or ſtretching the
" nerves, ſuch as inflammation, wounds, ſchir-
" rhous or ſteatomatous tumors, &c. may pro-
" duce the ſame effect.

" The fourth cervical, after ſending off
" that branch which joins with the third to
" form the phrenick, runs ſtrait to the Axilla,
" where it meets with the fifth, ſixth and ſe-
" venth cervicals, and firſt dorſal that eſcape in
" the interſtices of the Muſculi Scaleni; and all
" of them are ſo often conjoined and blended,
" after they have given off nerves to the mu-
" ſcles of the neck, Scapula, arm, and Tho-
" rax, and to the teguments, that when the
" ſeveral ramifications go off in the Axilla to
" the different parts of the ſuperior extremity,
" 'tis impoſſible to determine which of them
" the branches belong to. The conſiderable
" branches

" branches into which they are divided are " six; these I shall presume to give proper di- " stinguishing names to, by which the descrip- " tion will be less confused, and the young " anatomist's memory better assisted to retain " what is so difficult to represent in words.

" 1. CUTANEUS runs down the forepart " of the arm, and serves the teguments, as " far as the palm of the hand and fingers.

" 2. MUSCULO-CUTANEUS, or Perfo- " rans Casserii passes through the Musculus " Coraco-Brachialis, and after supplying the " Biceps and Brachiæus Internus, is spent on " the teguments of the back of the Cubitus " and hand.

" 3. MUSCULARIS, that runs down the " fore part of the arm to be lost in the Mus- " culi Flexores Carpi, Digitorum, &c.

" 4. ULNARIS, which supplies the Exten- " sores Cubiti, and teguments of the elbow, " and then passing through the sinuosity at " the back of the external condyle of the " Humerus, runs along the Ulna, where it " gives twigs to the teguments and neighbour- " ing muscles, at length is lost in the back of " the hand, Musculi Interossei and Lumbri- " cales in the little finger, and side of the ring- " finger next to this. The course of this nerve " is sufficiently felt when we lean on our elbow,

" by

" by the insensibility and prickling pain in the
" parts to which it is distributed.

" 5. RADIALIS, goes down the fore-part
" of the arm near the Radius, bestowing bran-
" ches in its progress on the circumjacent mus-
" cles, and at the Ligamentum Annulare Car-
" pi splitting, is sent to the thumb, fore-finger,
" middle finger, an half of the ring finger, and
" to the back of the hand.

" 6. ARTICULARIS runs almost round
" the top of the Os Humeri, and serves the
" Musculi Extensores Cubiti, Retractores and
" Elevatores Humeri.

" BY a strong and continued pressure on
" these nerves, by crutches, or any such hard
" substance a palsy and atrophy of the arm
" may be occasioned.

" THE twelve dorsal nerves all communi-
" cate with one another as soon as they make
" their way out betwixt the Vertebræ, each of
" them gives a posterior branch to the Mus-
" culi Erectores Trunci Corporis; the first,
" after having sent off the brachial nerve, al-
" ready described, is after the same manner,
" with the succeeding eight, bestowed on the
" Pleura and intercostal muscles, the tenth
" and eleventh are most of them sent to the
" abdominal muscles, the twelfth communi-
" cates with the first lumbar, and is bestowed

" on

" on the Mufculus Quadratus Lumbalis and
" Iliacus Internus.

" The fifth lumbar alfo communicates and " gives pofterior branches; the firft fends fe- " veral branches to the abdominal mufcles, " and Pfoas and Iliacus, while others go from " it to the teguments and mufcles on the fu- " perior and anterior part of the thigh, and " the main trunk of it is loft in the crural. The " fecond paffes through the Pfoas mufcle, and " is diftributed much as the former. The third " is loft in the Mufculus Pectineus. Branches " proceeding from the firft, fecond and third " make up one trunk, which runs along the " anterior part of the Pelvis, and flipping " through a fmall finuofity in the anterior " part of the Foramen Magnum Offis Ifchii, " is fpent in the Mufculus Triceps. This " nerve is commonly known by the name " of Obturator, or pofterior crural nerve. " By the union of branches from the firft, fe- " cond, third, and fourth lumbar nerves, the " anterior crural nerve is formed, which run- " ning along the Mufculus Pfoas, efcapes with " the large blood-veffels out of the Abdomen " below the tendinous arcade of its mufcles, " and is diftributed to the mufcles and tegu- " ments on the fore part of the thigh: One " branch of this crural nerve accompanies the " Vena Saphæna as far as the ancle. Now let

" us

" us imagine the ſituation of the kidney upon, " and the courſe of the Ureter over theſe nerves, " and we ſhall not be ſurprized, that in a Ne- " phritis, the trunk of the body cannot be " raiſed erect without great pain; that the thigh " loſes of its ſenſibility, and that it is drawn " forwards. The remainder of the fourth and " the fifth lumbar nerves join with the firſt, ſe- " cond, and third that proceed from the Os Sa- " crum: Theſe five, when united, conſtitute the " largeſt nerve of the body, ſo well known by " the name of the ſciatic, or iſchiatic nerve, " which ſeems to be bigger, in proportion to " the part for the uſe of which it is, than the " nerves of any other part are; the deſign of " which may be to afford ſufficient ſtrength " to the muſcles of the lower extremity, for " exerting a force ſuperior to what is requi- " red in any other part of the body. When " this nerve is any way obſtructed, we ſee " how unable we are to ſupport our ſelves, or " to walk. The ſciatic nerve then goes out " at the large hollow, behind the great tuber- " cle of the Os Iſchium, and paſſing over the " Quadrigemini muſcles, runs down the poſte- " rior part of the thigh, giving off, every " where as it goes, nerves to the teguments " and muſcles of the the thigh and leg. At the " ham it ſplits into two; the ſmaller mounts " over the Fibula, and ſerving the Muſculi

" Peronei, Flexores Pedis, and Extenſores Di-
" gitorum, is continued to the toes along the
" broad of the foot, while the larger trunk
" ſinks under the Muſculi Gemelli, and then
" divides; one is ſpent on the muſcles at the
" back of the leg and teguments, while the
" other is continued by the inner anckle to
" the foot, and then ſub-divides; one branch
" is diſtributed after the ſame manner as the
" Ulnaris, and the other as the Radialis in the
" hand.

" The other nerves that come out of the
" Os Sacrum are ſent to the organs of generati-
" on, Muſculi Levatores Ani and Obturatores.

" Theſe nerves of the Medulla Spinalis may
" all be diſſected and demonſtrated in the
" ſame order in which they are deſcribed."

The nerves ſeem, when examined with a microſcope, to be bundles of ſtreight fibres not communicating with one another: And I am inclined to think that every the minuteſt nerve, terminating in any part, is a diſtinct cord from its origin in the brain, or ſpinal marrow; or elſe I do not ſee how they could produce diſtinct ſenſations in every part; and the diſtinct points of ſenſation throughout the body are ſo very numerous, that the whole body of nerves (which taken together would not make a cord of an inch diameter) muſt be divided into ſuch a number, to afford one for every part that has

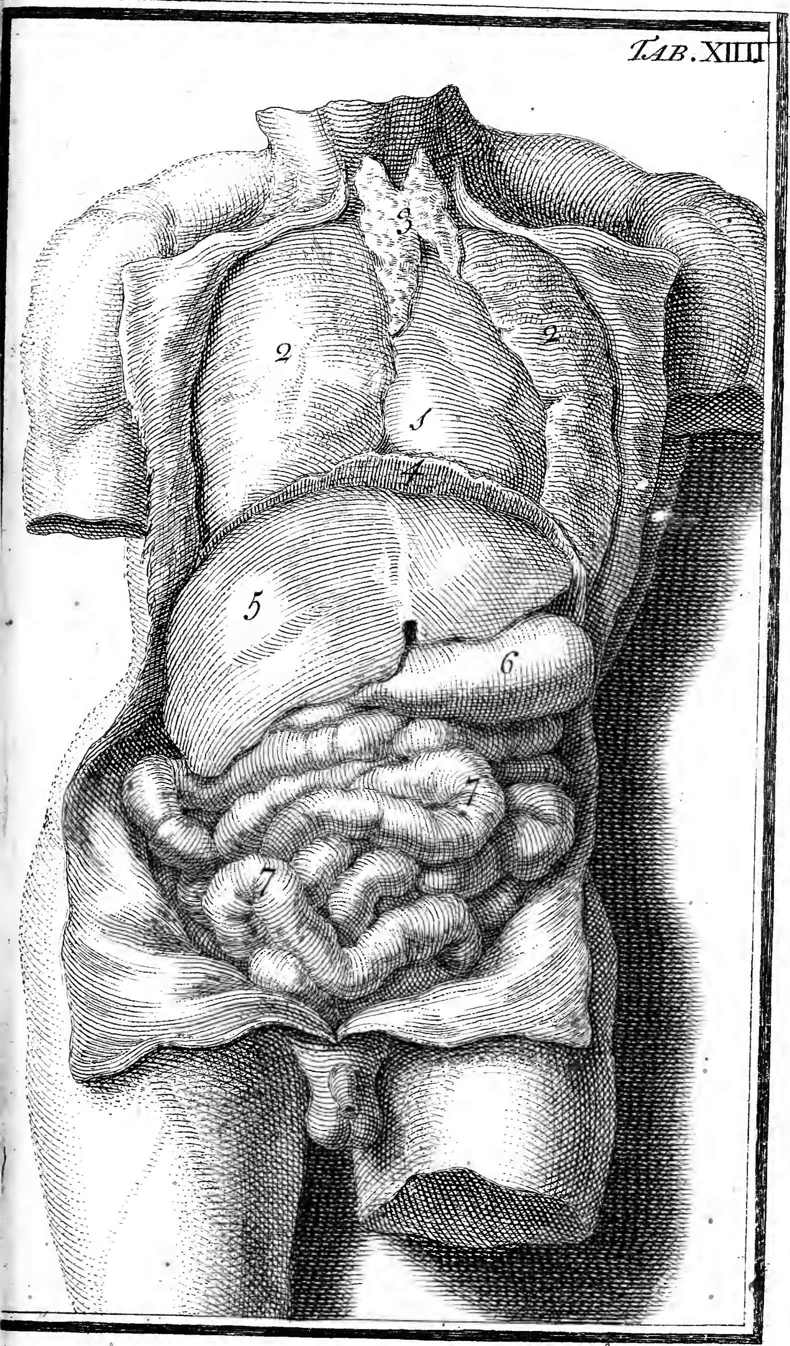
has a diſtinct ſenſation, that ſurely ſuch a nerve would be too ſmall to be ſeen by the beſt microſcope. They all paſs in as direct courſes to the places they ſerve as is poſſible, never ſeparating nor joining with one another but at very acute angles, unleſs where they unite in thoſe knots which are called ganglions, the uſe of which I do not pretend to know; they make what appears to be a communication of moſt of the nerves on the ſame ſide, but never join nerves of oppoſite ſides.

THAT the nerves are inſtruments of ſenſation, is clearly proved from experiments, but how they convey thoſe ſenſations to the brain, is matter of great diſpute. The moſt general opinion is that they are tubes to contain animal ſpirits, by whoſe motions theſe ſenſations are conveyed: And diligent enquiry has been made to diſcover their cavities, but hitherto in vain; and if each nerve is diſtinct from its origin, as I have endeavoured to ſhew, and too ſmall to be the object of the beſt microſcope, I do not ſee how ſuch cavities are like to be diſcovered. However, I think the nerves may be tubes, and that a fluid, whoſe coheſion is very little, and whoſe parts are perhaps no finer than light, may move very freely in them. Thoſe who deny animal ſpirits in the nerves, ſuppoſe that the ſenſation is conveyed by a vibration. To which it is objected, that they are ſlack,

flack, moift, and furrounded with foft parts, and are therefore unfit for vibrations, as indeed they are for fuch as are made on the ftrings of a mufical inftrument; but the minuteft vibrations, fuch as they cannot be without may be as fufficient for this end, as the impulfe of light upon the Retina, is for the fenfe of feeing. So that for ought that I can difcern, fenfations may be conveyed either, or both ways, though the advocates for each opinion, have chiefly infifted upon the improbability or impoffibility of the other opinion.

TABLE XIV.

1. The Pericardium covering the heart.
2, 2. The lungs.
3. The gland Thymus.
4. The diaphragm.
5. The liver.
6. The ſtomach.
7, 7. The ſmall guts.



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TAB . XV.

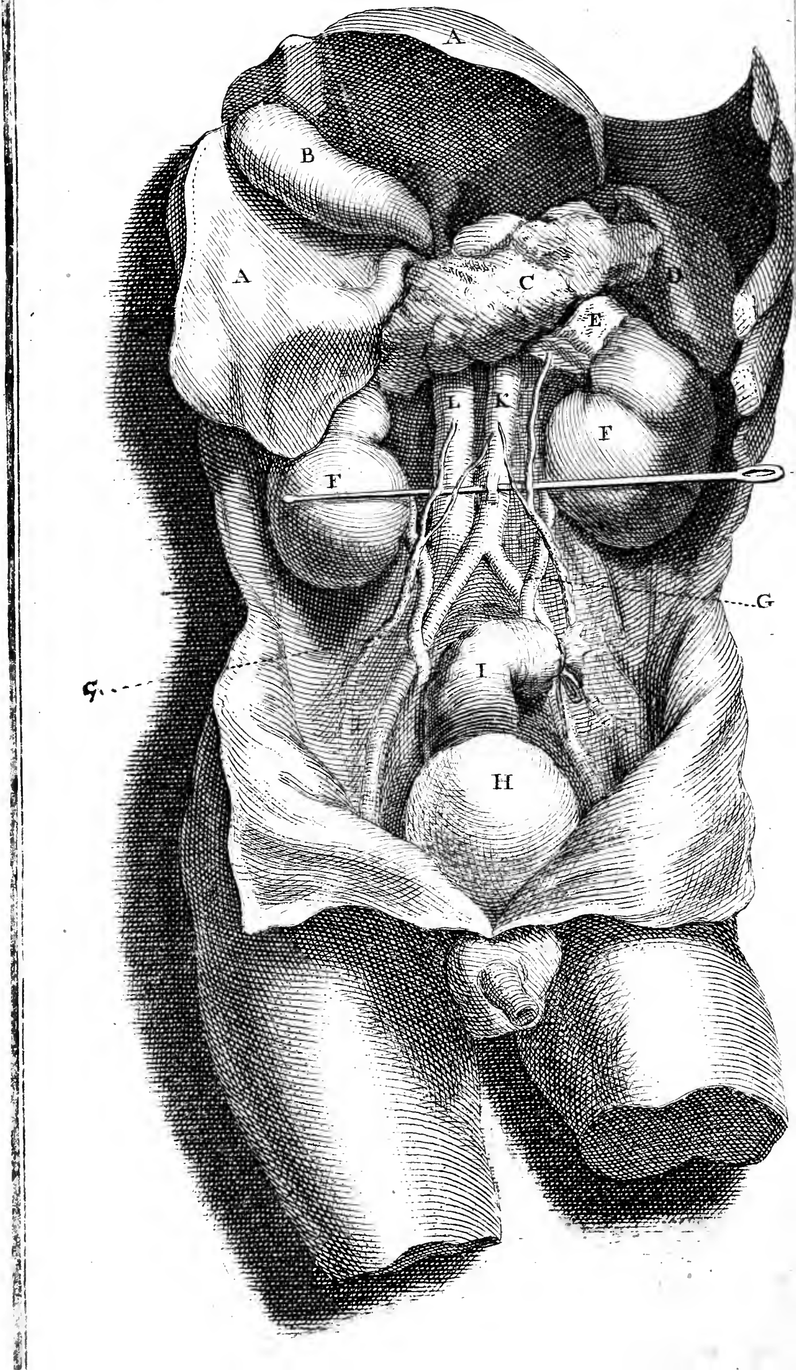


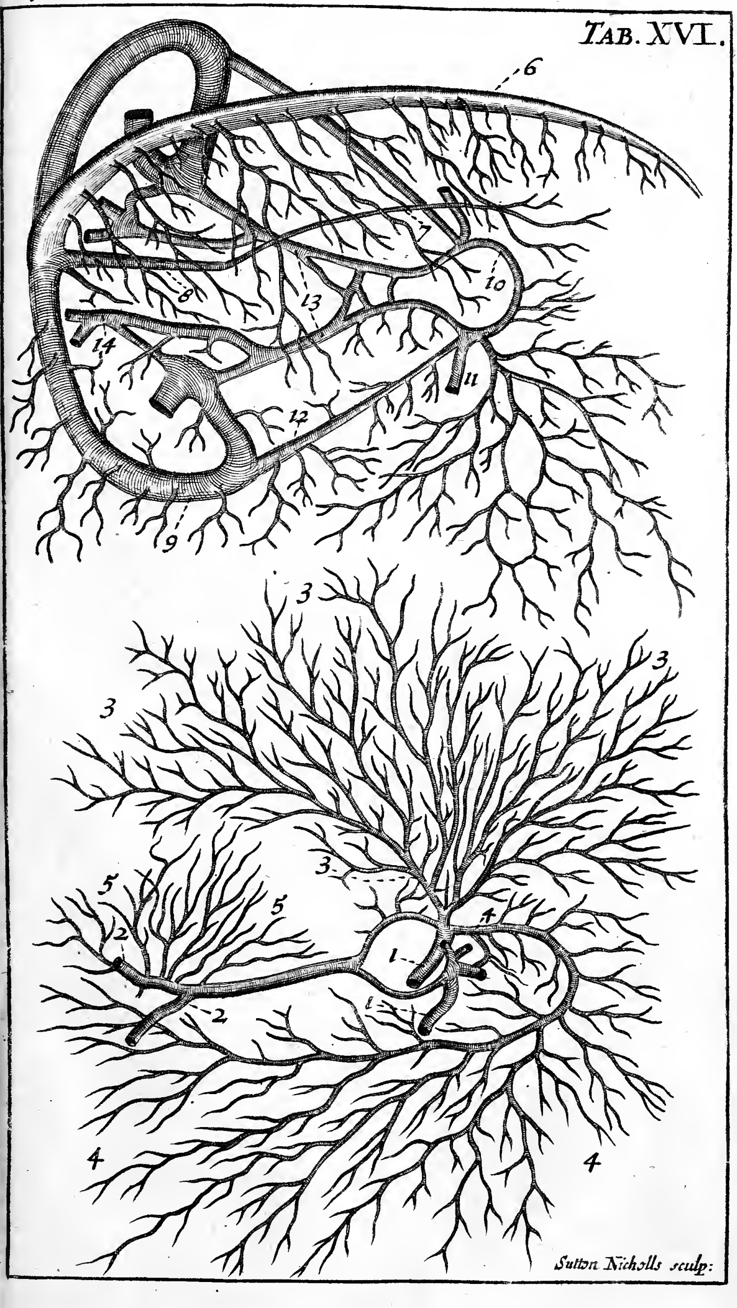
TABLE XV.

A, The liver.
B, The gall-bladder.
C, The Pancreas.
D, The ſplene.
E, One of the renal glands.
F, F The kidneys.
G, G, The ureters.
H, The bladder of urine diſtended.
I, The Rectum Inteſtinum.
K, The Aorta.
L, The Vena Cava.
M, The four ſpermatick veſſels, with the Arteria Meſenterica Inferior, raiſed over a probe; the middle one the Arteria Meſenterica Inferior; the two next the ſpermatick arteries ariſing from the Aorta; the outmoſt the ſpermatick veins, the right ending in the Cava, the left in the left emulgent vein.

TBLE XVI.

The vessels of the brain filled with Wax.

1, 1, The carotid artery,
2, 2, The cervical artery.
3, 3, &c. The branches of the carotid artery which passes between the lobes of the brain on the left side.
4, 4, 4, The branches from the carotid artery which pass between the hemispheres of the brain.
5, 5, The branches from the cervical artery, which are bestowed upon the Cerebellum.
6. The superior longitudinal Sinus.
7. The inferior longitudinal Sinus.
8. The strait Sinus.
9. The lateral Sinus.
10. The circular Sinus.
11. A vein from the circular Sinus.
12. A Sinus at the upper edge of the Os Petrosum.
13. A Sinus at the lower edge of the Os Petrosum.
14. The cervical Sinus.


TAB. XVI.
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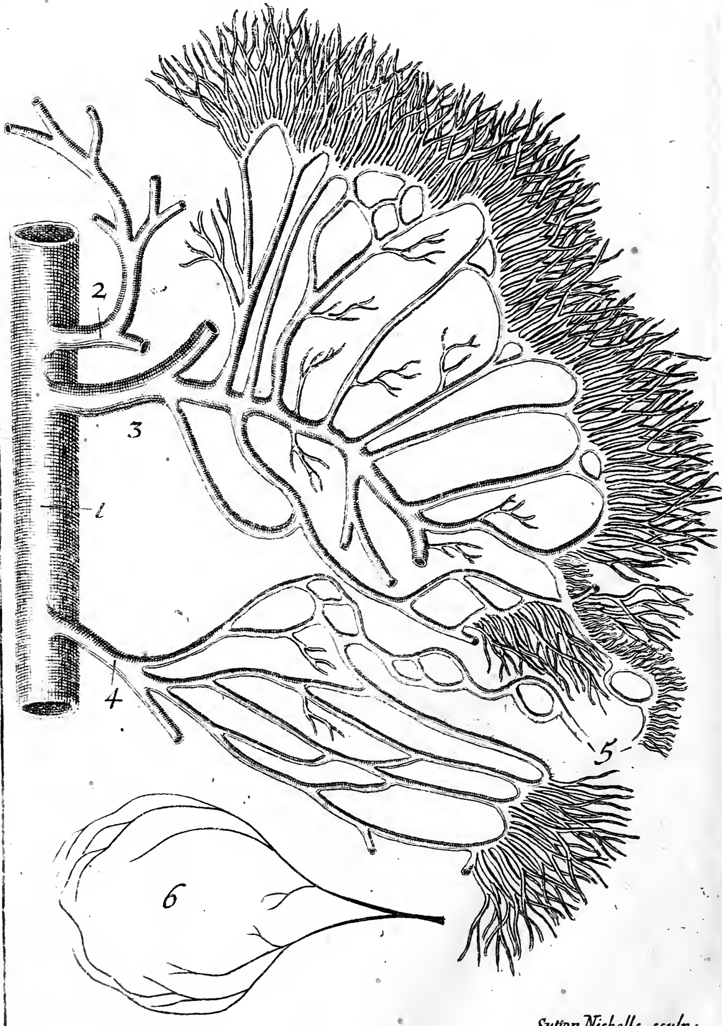
Sutton Nicholls sculp:

TAB. XVII



Sutton Nicholls sculp:

TABLE XVII.

Arteries filled with wax.

1. Part of the descending Aorta.
2. Arteria Cœliaca.
3. Mesenterica Superior.
4. Mesenterica Inferior.
5. Part of the communicant artery.
6. Shews one of the extream mesenteric arteries, as it is distributed round the intestine.

TABLE XVIII.

The Vena Portæ filled with wax.

1, 1, 1. THE extream branches of the Vena Portæ in the mesentery.

2. The single trunk of the Vena Portæ entering the liver.

3, 3, 3. The extream branches of the Vena Portæ in the liver.

4. One of the extream mesenteric veins.

TABLE

1
1
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2
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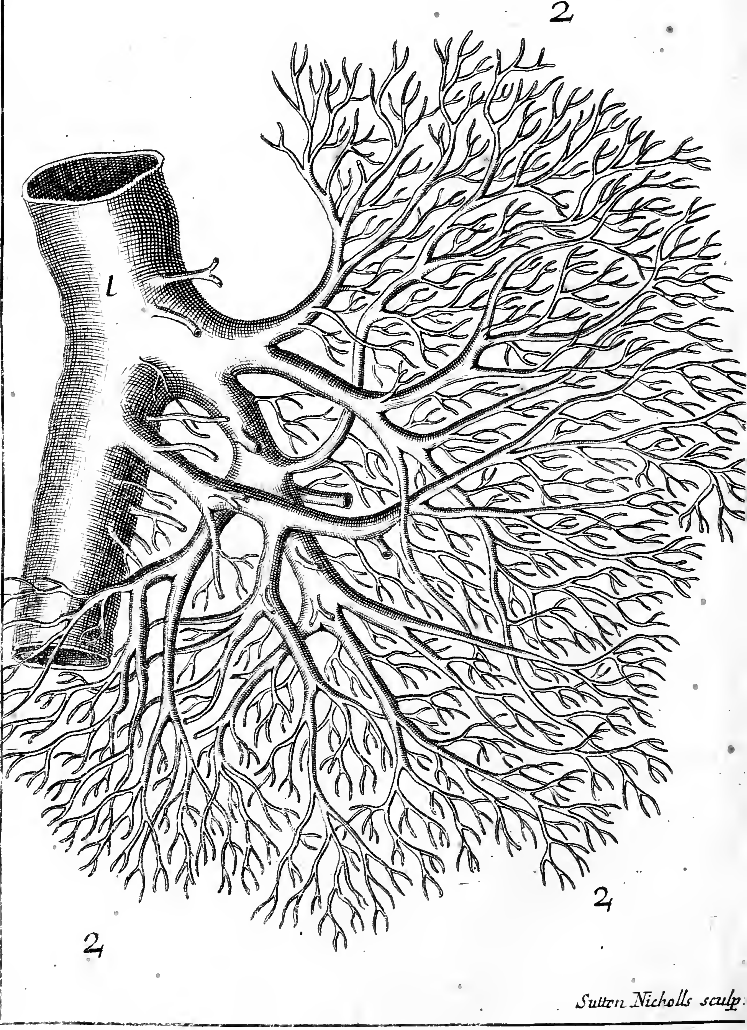
TAB. XIX



Sutton Nicholls sculp.

TABLE XIX.

The veins of the liver.

1. PART of the Vena Cava Ascendens.

2, 2, 2. The branches of the Cava taken out of the liver.

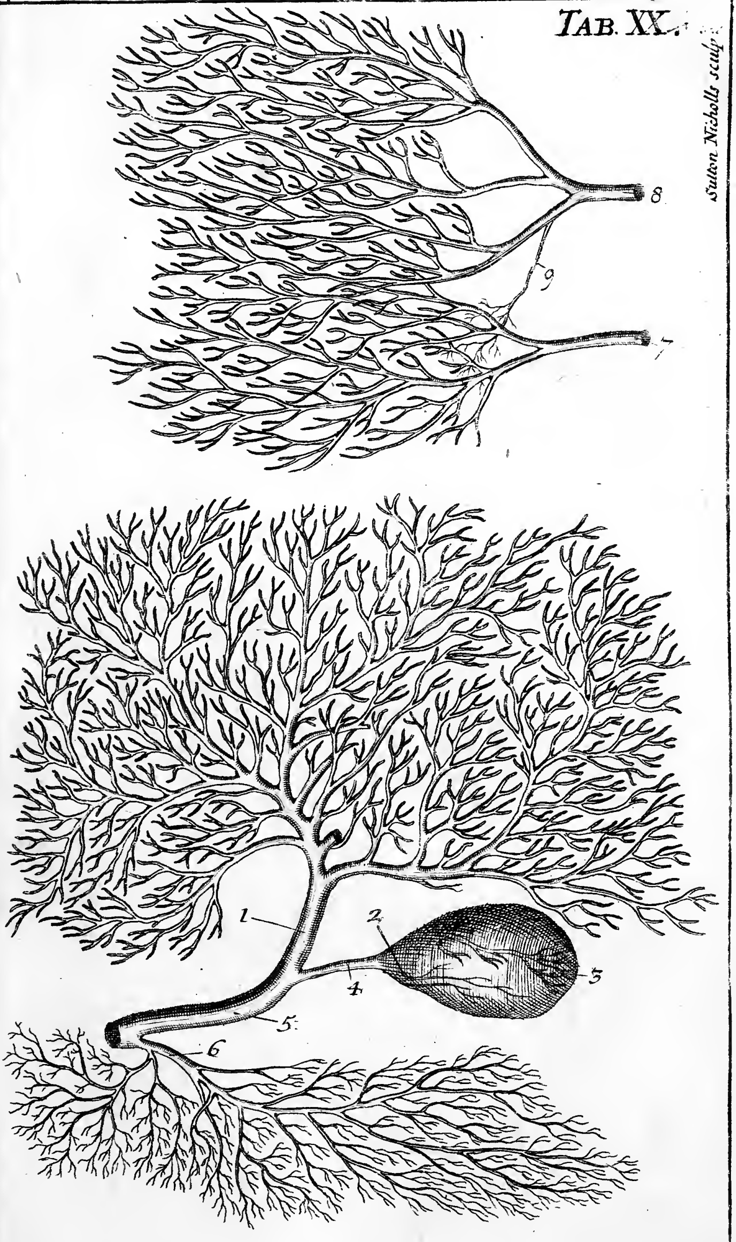
TABLE XX.

The excretory ducts and arteries of the liver.

1. DUCTUS HEPATICUS, with its branches, taken out of the liver.
3. The gall-bladder.
4. Ductus Cysticus.
5. Ductus Communis Choledochus.
6. Ductus Pancreaticus.
7. The hepatic artery, which is given off from the superior mesenteric.
8. The hepatic artery, which is given off from the celiac.
9. Arteria Cystica.

TABLE

TAB. XX.



TAB. XXI.

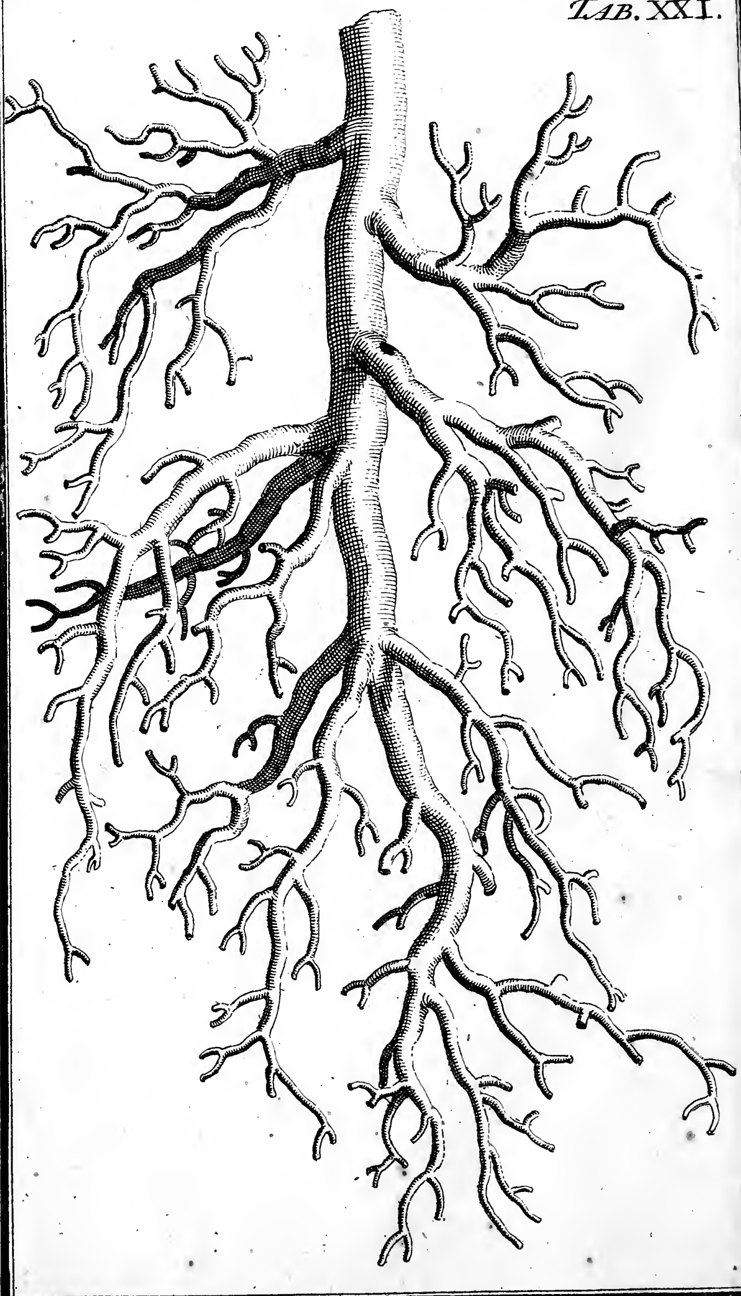


TABLE XXI.

A POLYPUS coughed up out of the lungs, which admirably ſhews the manner of the Aſpera Arteria dividing in the lungs; communicated to me by the late Dr. Oliver Horſeman.

TABLE XXII.

FIGURE 1

SHEWS the circulation of the blood, in the tail of a greg, from Mr. Cooper.

A, A, A, Where the extremities of the arteries and veins communicate.

B, B, B, B, Several other communications.

FIGURE 2

SHEWS the circulation of the blood, in the tail of a gudgeon.

A, A, A, The large veſſels.

B, B, B, The extremities of arteries communicating with the veins.

C, C, Some ſmall veſſels whoſe extremities could not be ſeen for the thickneſs of the tail.

TAB. XXII.

Fig. I.

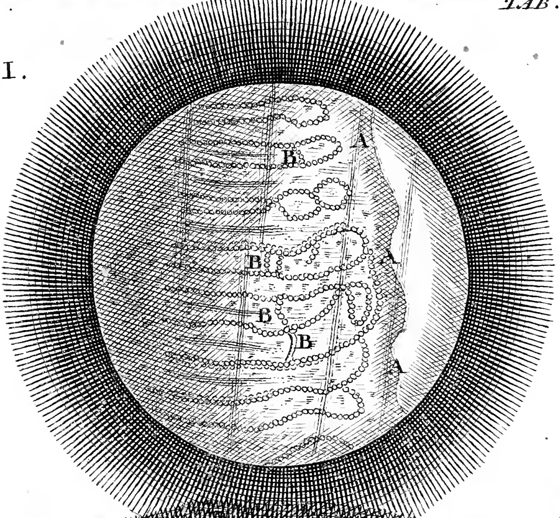
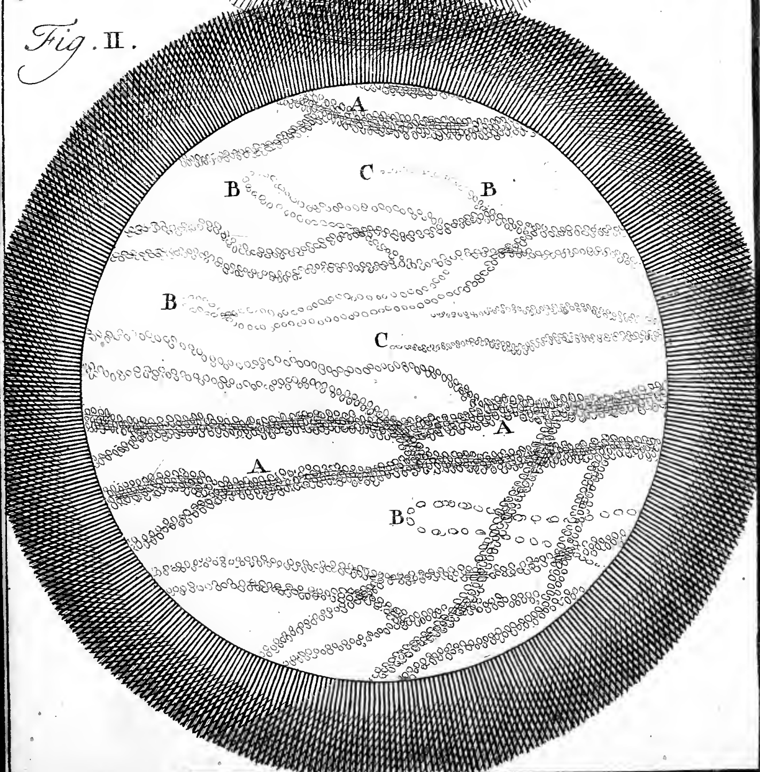


Fig. II.



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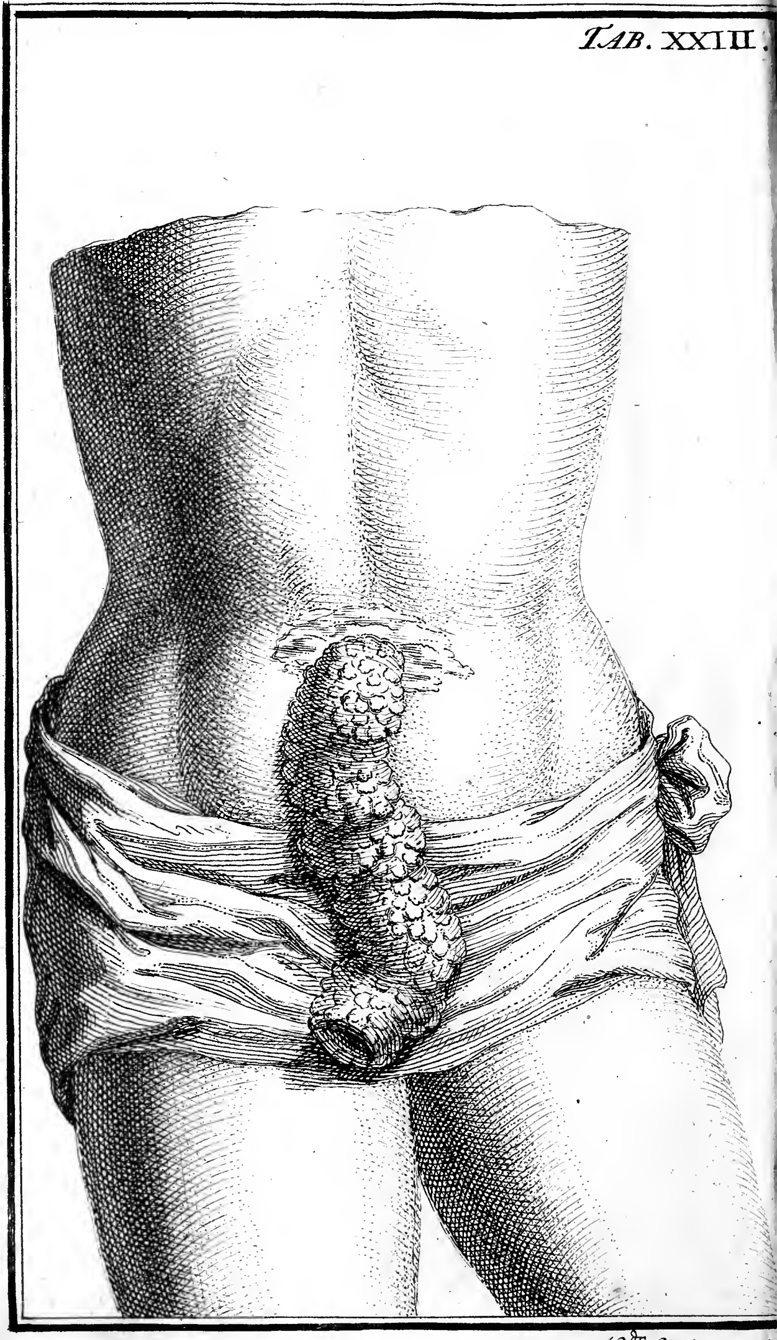
TAB. XXIII.



V.dr Gucht Sculp

TABLE XXIII.

THE caſe of Mrs. Stoneſtreet of Lewes, Vid. page 170.

TABLE XXIV

REPRESENTS the caſe of Margaret White, mentioned page 171.

A, The gut hanging out at the navel.


A

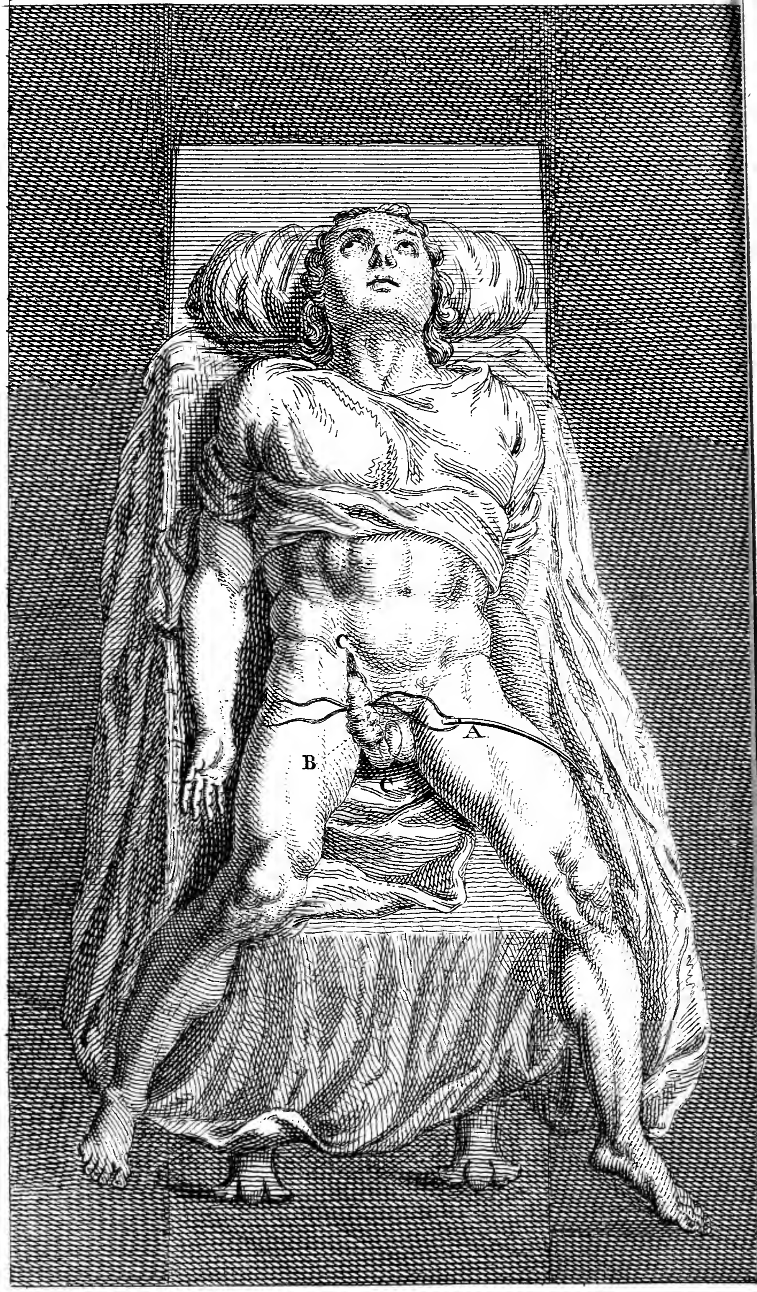

A
B
C

TABLE XXV

REPRESENTS the caſe of John Heyſham, who, the friday before Eaſter in the year 1721, by over-ſtraining himſelf at work, had a rupture of his inteſtines into his Scrotum, which could by no means be reduced. He was brought into St. Thomas's hoſpital the monday following, and I would have performed the operation immediately, but he refuſing to ſubmit, I deferred it till tueſday morning, when he being willing, I performed the operation, and making a large wound in the bottom of the Abdomen, the inteſtines were eaſily reduced, and near a quart of water was diſcharged out of the Scrotum at the ſame time. There had been a rupture of the Omentum before, and it being united to the Scrotum and ſpermatic veſſels, I paſſed a needle, with a double ligature (as is expreſſed in the plate) under that part of the Omentum that adhered, ſo as not to hurt the ſpermatic veſſels; then cutting out the needle, I tied one of the ſtrings over the upper part of the Omentum, and the other over the lower, and then cut off as much of it as was in the way. My reaſon for tying in this manner was to ſecure the blood-veſſels, which, I think, could not be done ſo well with one ligature, becauſe of the largeneſs of the

adheſion

adhesion and the texture of the Omentum, which renders it too liable to be torn by such a bandage. Three days after the operation an Erisipylas begun in his legs, and spread all over his body, the cuticle every where peeling off; yet he recovered, and continues in a good state of health. After he was cured, at first he wore a small truss, but left it off in a short time, and feels no inconvenience from it, though he lives by hard labour.

A, The needle threaded with a double ligature.
B, The Omentum.
C, C, The extremities of the wound.

TABLE

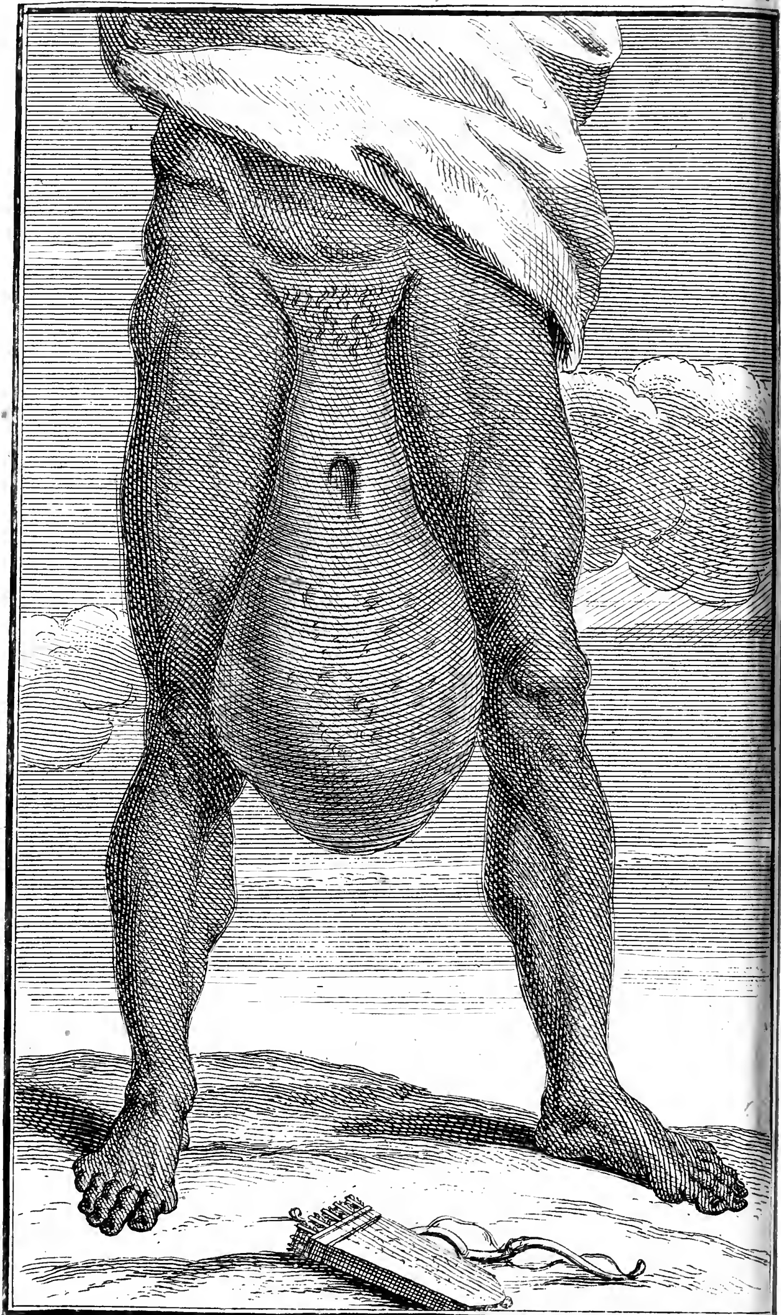


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TABLE XXVII.

THE lower parts of a negroe, whoſe Scrotum was ſwelled to this ſize from a kick (the ſpermatic veſſels being not at all thickened.) The greateſt length was twenty ſeven inches, and the greateſt horizontal circumference forty two inches. He was the late Mr. Dickenſon's patient in St. Thomas's hoſpital; the tumour was ſolid, without inflammation or pain, but what parts were affected we could not learn, he not ſtaying for the operation. At the dark place he could pull out his Penis, when the Scrotum was lifted up.

BOOK IV.

CHAP. I.

Of the urinary and genital parts of men, together with the Glandulæ Renales.

THE urinary parts are the kidneys with their veſſels and bladder of urine.

THE kidneys of men are like thoſe of a hog, the two weigh about twelve ounces; they are ſeated towards the upper part of the loins upon the two laſt ribs, the right under the liver, and a little lower than the other, and the left under the ſpleen. Their uſe is to ſeparate the urine from the blood, which is brought thither for that purpoſe by the emulgent arteries; and what remains from the ſecretion, is returned by the emulgent veins, while the urine ſecreted is carried off through the ureters to the bladder. Tab. xv. F. Tab. xxvii. 5.

THE ureters, are tubes about the bigneſs of gooſe-quills; and about a foot long, they ariſe Tab. xv. G, G. Tab. xxvii. 8.

arise from the hollow side of the kidneys, and end in the bladder near its neck, running obliquely for the space of an inch between its coats; which manner of entering, is to them as valves. (Vid. page 191.) The beginning of the ureters in the kidneys, are the Tubuli Urinarii, which join from the Pelvis in each kidney. Between the Tubuli Urinarii, authors have remarked small Papillæ; and the parts which distinguish themselves by a clearer colour, they call Glandulæ.

Tab. xxvii. 22.

Tab. xxvii. 11.

Tab. xxvii. 10.

Tab. xv. H.

The bladder of urine, is seated in a duplicature of the Peritoneum in the lower part of the Pelvis in the Abdomen; its shape is orbicular, and its coats are the same with those of the guts, and other hollow muscles already described; viz. an external membranous, a middle muscular, which is the Musculus Detrusor Urinæ, and an inner membranous coat, exceeding sensible, as is fully shewn in the cases of the stone and gravel. The use of this nice sense is, to make it capable of that uneasiness which excites animals to exclude their water, when the bladder is much extended. Some anatomists not thinking how soon fluids taken into the stomach, and not retained there, by being mixed with solids, may pass into the blood, as the effects from drinking strong liquors, or Laudanum, or drinking without eating when we are hot, sufficiently shew; and

6 also

alſo not conſidering the ſhortneſs of the courſe, from the ſtomach to the kidneys this way, together with the ſize of the emulgent arteries, and the velocity of the blood in them, have imagined and affirmed, that there muſt be ſome more immediate courſe from the ſtomach or guts to the bladder, and not conſidering either how ſuch a courſe would have interrupted one great end in the animal œconomy, or that veſſels fit to fill the bladder faſter than the ureters, muſt have been too large to be concealed.

GLANDULÆ RENALES are two glands ſeated immediately above the kidneys, of no certain figure, nor do we know their uſe; but always paint and deſcribe them with the urinary parts becauſe of their ſituation: In a very young Fœtus they are larger than the kidneys, and in an adult but a little larger than in a Fœtus. They receive a great many ſmall arteries, and return each of them one or two veins. In their inſide is a ſmall Sinus tinctured with a ſooty coloured liquor. Tab. xv. E. Tab. xxvii. 7.

VALSALVA, in a diſcourſe before the academy of ſciences at Bologna, has given an account of a duct from theſe glands to the Epididymides in men, and the Ovaria in women, and undertook to prove that they are principal organs of generation, and promiſed to publiſh a treatiſe on this ſubject as ſoon as the cuts for it could be made; but being ſince dead, we

U do

do not yet know what was done towards it. Mr. Renby has ſearched very carefully to diſcover them, but in vain: However he has obſerved a ſmall artery, which dividing, ſends one branch into the renal gland, and the other into the Epididymis, which he thinks Valſalva has miſtaken for a duct.

The genital parts of men are the Teſtes and Penis, with their veſſels, &c.

The office of the Teſtes, is to ſeparate the ſeed from the blood; they are ſeated in the Scrotum, and are ſaid to have four coats, two common, and two proper. The common are the outer ſkin and a looſe membrane immediately underneath, called Dartos. The firſt of the proper, is the Proceſſus Vaginalis; it is continued from the Peritoneum to the teſticle, which it incloſes with all its veſſels, but is divided by a Septum, or an adheſion immediately above the teſticle, ſo that no liquor can paſs out of that part of this membrane which encloſes the ſpermatic veſſels into that which encloſes the teſticle. Large quantities of water are ſometimes found in theſe cavities, which diſeaſe is ſeldom cured without opening the cavity where the water is contained, as in ſinuous ulcers: But a true Hernia Aquoſa is a rupture through the Peritoneum from the Abdomen, which may be cured by a puncture; and in this caſe, as in the Hernia Inteſtinalis,

and Omentalis, when once a cavity is ſtretched out, the inſide of it is ſoon formed into a ſtrong membrane like that of a Cyſtic tumour, and looks as if the Peritoneum it ſelf had been ſtretched down thither, and thickened. (Vid. Muſculi Abdominis.) The other proper coat, is the Albuginea, which is very ſtrong, immediately incloſing the teſticles. The teſticles of a rat may be unraveled into diſtinct Tab. xxviii. A, B, D. veſſels and the texture of the teſticles of all other animals appear to be the ſame, but their veſſels are too tender, or cohere too much to be ſo ſeparated.

The teſticles, receive each, one artery from Tab. xv. M. the Aorta, a little below the emulgents, which, Tab. xxvii. 12. unlike all other arteries, ariſe ſmall, and dilate in their progreſs, that the velocity of the blood may be ſufficiently abated for the ſecretion of ſo viſcid a fluid as the ſeed. The right teſti- Tab. cle returns its vein into the Cava, and the left xxvii. 13. into the emulgent vein on the ſame ſide; both becauſe it is the readieſt courſe, and becauſe, as authors ſay, this ſpermatic vein would have been obſtructed by the pulſe of the Aorta, if it had croſſed that veſſel to go to the Cava.

A gentleman whom I caſtrated, who truſted too much to his own reſolution, and refuſing to have any one preſent to hold him, except Mr. Geeke, who was my aſſiſtant; during the operation, moved ſo much, that the

ligature which tied all the veſſels with the proceſs together, ſlipt, and only tied the proceſs over the ends of the veſſels, which being perceived ſoon after the operation, I cut the ligature, and took out the extravaſated blood, and tied the artery alone, which gave but little pain, and it digeſted off in a week's time, and the wound being afterwards ſtitched, though the teſticle weighed a pound, it was perfectly well in five weeks; which is in leſs time than the ligature often requires to be digeſted off, when the proceſs and all the veſſels are tied together. However if this caſe is not ſufficient to recommend doing this operation by tying the artery only, it may be ſufficient to recommend extraordinary care in doing of it the uſual way, for if the blood had found an eaſy paſſage into the Abdomen, the patient might have bled to death without our knowledge.

Tab. xxvii. 17. ON the upper part of the teſticles, are hard bodies called Epididymi; which are evidently the beginnings of the Vaſa Deferentia. I have unravelled them backward, in ſingle veſſels, and then into more and ſmaller, like the excretory veſſels of other glands.

Tab. xxvii. 18. VASA DEFERENTIA, are excretory ducts to carry the elaborated ſeed to the Veſiculæ Seminales. They paſs from the Epididymi of the teſticles, together with the blood-veſſels, till they have entered the muſcles of the Abdomen,

domen, and then they paſs under the Peritoneum, directly through the Pelvis, to the Veſiculæ Seminales.

Vesiculæ Seminales, are two bodies that appear like veſicles, they are ſeated under the bladder of urine, near its neck; they may be each of them eaſily unravelled into one ſingle duct, which diſcharge into the Urethra, by the ſides of the Roſtrum Gallinaginis, which is an eminence in the underſide of the Urethra, near the neck of the bladder. In theſe veſicles or ducts the ſeed is repoſited againſt the time of coition; but in dogs there are no ſuch veſicles, therefore nature has contrived a large bulb in their Penis, which keeps them coupled, ſeemingly againſt their inclinations, till the ſeed can arrive from the teſticles. The ſeed paſſes from theſe veſicles in men, and even from the Vaſa Deferentia, in time of coition, through the proſtrate glands into the Urethra; as in thoſe animals that have no Veſiculæ Seminales, for when the ducts into the Urethra are diſtended, that is the directeſt courſe from the Vaſa Deferentia, as well as from the Veſiculæ Seminales.

Tab. xxvii. 19.

Tab. xxvii. 21.

Prostatæ, are two glands, or rather one, about the ſize of a nutmeg: They are ſeated between the Veſiculæ Seminales and Penis, under the Oſſa Pubis, almoſt within the Pelvis of the Abdomen. They ſeparate a lympid

Tab. xxvii. 20.

glutinous humour which is carried into the Urethra by feveral ducts, which enter near thofe of the Proftatæ; this liquor feems to be defigned to be mixed with the feed in the Urethra, in the time of coition, to make it flow more eafily.

PENIS, its fhape, fituation, and ufe, need no defcription. It begins with two bodies, named Crura, from the Offa Ifchia, which unite under the Offa Pubis, and are there ftrongly connected by a ligament. In its under part is a channel from the bladder, called Urethra, through which both the urine and feed pafs; its fore-part is called Glans, the loofe fkin which covers it, Præputium, and the ftrait part of that fkin on the under fide, Frœnum.

THE Urethra, is lined with a membrane filled with fmall glands, that feparate a Mucus, that defends it from the acrimony of the urine. Thefe glands are largeft neareft the bladder. Mr. Cowper defcribes three large glands of the Urethra, which he difcovered; two of which are feated on the fides of the Urethra, near the ends of the Crura Penis; to which he adds a third, lefs than the other, feated almoft in the Urethra, a little nearer the Glans than the former. All thefe glands have excretory ducts into the Urethra.

THE

THE inner texture of the Penis is ſpongy, like the inner texture of the ſpleen, or the ends of the great bones. It is uſually diſtinguiſhed into Corpus Cavernoſum Penis, Glandis and Urethræ; the firſt of theſe makes part of the Glans, and is divided its whole length by a Septum; the other two are compoſed of ſmaller cells, and are but one body. On the upper ſide of the Penis, are two arteries, and one vein called Vena Ipſius Penis. The arteries are derived from the beginnings of the umbilical arteries, which parts never dry up, and the vein runs back to the iliac veins. The Vena Ipſius Penis, being obſtructed, the blood that comes by the arteries, diſtends the cells of the whole Penis, and makes it erect; but to prevent any miſchief from this mechaniſm, there are ſmall collateral veins on the ſurface of the Penis, that carry back ſome blood all the time the Penis is erect. By what power the Vena Ipſius Penis is obſtructed to erect the Penis, I cannot conceive, unleſs ſmall muſcular fibres conſtrict it. Moſt authors think the Muſculi Erectores Penis do it, by thruſting the Penis againſt the Os Pubis; but they are not ſeated, as Mr. Cowper obſerves, conveniently for ſuch an office; beſides, if a preſſure from the lower ſide of the Penis is ſufficient, an artificial preſſure, which may be much greater, ſhould, I think, produce the ſame effect. When the

Tab. xxvii. A, A.

matter of a gonorrhea is ſo virulent as to make ulcers in the Urethra, when thoſe ulcers cicatriſe they conſtrict the Urethra, and make that difficulty in the waters paſſing, which is vulgarly thought to proceed from caruncles.

Tab. xxviii. E. IN the ſeed of men, and of many other male animals, Lewenhoeck, by the help of microſcopes, diſcovered an infinite number of animals like tadpoles, which he and others ſuppoſe to be men in miniature, and that one of theſe being entered into an egg in one of the Ovaria, (See the next chapter.) conception is performed. But though ſcarce any one, that has made due enquiry, has ever doubted of the exiſtence of theſe animals, yet there are many who object againſt this hypotheſis; and though I am inclined to think it true, yet I will endeavour impartially, to lay down the principal objections and anſwers, that the reader may judge for himſelf. The firſt and ſtrongeſt objection, is raiſed from the ſeveral inſtances that have happened of mixed generation, where the animal produced always appears to partake of both kinds, as in the common caſe of a mule, which is begot by an aſs upon a mare; when according to that hypotheſis, they expect the animal produced from mixed generation, ſhould be entirely of the ſame ſpecies with the male animal; as the ſeeds of plants, whatever earth they grow in, always produce plants of the ſame

ſame kind; nevertheleſs if we conſider what influence womens fears or longings, frequently have upon their children in Utero, and how great a change caſtration makes in the ſhape of any animal, and that a lamb ſuckled by a goat (if I have been rightly informed) grows hairy like a goat, we cannot then wonder if the mothers blood, to which the animal owes its nouriſhment and encreaſe, from the time of impregnation to the time of its birth, ſhould be thought a ſufficient cauſe of reſemblance between theſe animals and their mothers. Another objection is, that nature ſhould provide ſuch a multiplicity of theſe animals, when ſo few can ever be of uſe, an animal being to be generated of one only. To which it has been anſwered, that in all plants a vaſt number of ſeeds are found, though a very few of the whole that are produced, fall into the earth, and produce plants; and as in plants the greateſt part of their ſeeds are the food of animals, ſo the greateſt part of the Animalculæ, may as well live a time to enjoy their own exiſtence, as any other animal of as low an order. The laſt objection is their ſhape, which I think, will appear to have no weight, when we conſider how the eggs of flies produce maggots, which grow up into flies; and the tadpole produced from the egg of a frog, grows into a form as different from a tadpole as the form of a man: And if theſe ani-

I mals

mals had produced ſo few at a time, as that their young might have undergone this change in Utero, it is highly probable, that we ſhould not ſo much as have ſuſpected theſe analgous changes. But how the Animalculæ themſelves are produced, is a difficult queſtion, unleſs by equivocal generation, ſeeing none of them appear to be in a ſtate of encreaſe, but all of a ſize.

IN a boy that died of the ſtone, I found a double Ureter, each part being dilated to an inch diameter; the Pelvis in each kidney to twice its natural bigneſs, and the Tubuli Urinarii, each as large as the Pelvis.

IN a man that had never been cut for the ſtone, I found the Ureters dilated in ſome places to four inches circumference, and in others but little dilated, and a ſtone that I found in the bladder was leſs than a nutmeg, which muſt have fallen in ſeveral pieces, or both ureters could not have been dilated. From this, and other like obſervations, I think it appears that the prodigious ſize to which the ureters are uſually extended, in people who are troubled with the ſtone, is owing to ſmall ſtones which ſtick at the entrance into the bladder, until the obſtructed urine which dilates the ureters, can force them into the bladder.

I HAVE once met with a kidney almoſt conſumed, and lymphatics in a diſeaſed teſticle, as large as a crow-quil.

CHAP.

CHAP. II.

Of the genital parts of women.

THE external parts, are the Mons Veneris, which is that rising of fat covered with hair above the Rima Magna upon the Os Pubis, the great doubling of the skin on each side the Rima called Labia, and within these a lesser dou- Tab.xxix. bling named Nymphæ. These help to close up 1. the orifice of the Vagina: The Nymphæ are Tab.xxix. usually said to serve to defend the Labia from 2. the urine; but I do not see how the Labia stand more in need of such a defence, than the Nymphæ themselves.

CLITORIS, is a small spongy body bearing some analogy to the Penis in men, but has no Urethra. It begins with two Crura from the Ossa Ischia, which uniting under the Ossa Pubis, it proceeds to the upper part of the Nymphæ, where it ends under a small doubling of skin, called Preputium; and the end which is thus Tab.xxix. covered is called Glans. This is said to be the 3. Tab.xxix. chief seat of pleasure in coition in women, as 4. the Glans is in men.

A LITTLE lower than this, just within the Vagina, is the exit of the Meatus Urinarius.

VAGINA, is seated between the bladder of Tab.xxix. urine and the Intestinum Rectum. The texture 6. of it is membranous, and its orifice is contract-

ed

ed with a Sphincter (Vid. Muſc. Sphincter Vaginæ;) but the farther part is capacious enough to contain the Penis without dilating. Near the beginning of the Vagina, immediately behind the orifice of the Meatus Urinarius, is conſtantly found in children, a valve called Hymen, which looking towards the orifice of the Vagina, cloſes it in the ſame manner that the valves of the ventricles of the heart, cloſe the entrance of the ventricles; but as children grow up, and the Sphincter Vaginæ grows more uſeful, this valve is proportionably ſmaller, and in women very rarely to be found, only ſome ſmall parts appearing in the place of this valve called Carunculæ Myrtiformes. There have been a few inſtances in which the edges of this growing together, it continued unperforate, until it has been neceſſary to make an inciſion to let out the Menſes. The inner part of the Vagina is formed into Rugæ, which are largeſt in thoſe who have not uſed copulation; and leaſt in thoſe who have had many children. Under theſe Rugæ are ſmall glands, whoſe excretory ducts are called Lacunæ: Theſe glands ſeparate a mucilaginous matter to lubricate the Vagina, eſpecially in coition; and are the ſeat of a Gonorrhea in this ſex, as the glands in the Urethra are in the male.

UTERUS,

UTERUS, is ſeated at the end of the Vagina; it is about one inch thick, two broad, and large enough to contain the kernel of a hazel nut; but in women that have had children a little larger. Its orifice into the Vagina, is called Os Tincæ, from the reſemblance it bears to a tench's mouth. It has two round ligaments which go from the ſides of it to the groins through the oblique and tranſverſe muſcles of the Abdomen, in the ſame manner as to the ſeminal veſſels in men. This way the gut paſſes in a Hernia Inteſtinalis in women, (Vid. Muſculi Abdominis.) Some authors mention Ligamenta Lata, which are nothing but a part of the Peritoneum. Near the ſides of the Uterus lie two bodies called Ovaria, they are of a depreſſed oval figure about half the ſize of men's teſticles, and have ſpermatic veſſels; they contain ſmall pellucid eggs, from which they have their name. There are two arteries and two veins, which paſs to and from the ovaries or teſtes, in the ſame manner that they do in men; but make more windings, and the arteries dilate more ſuddenly, in proportion as as they are ſhorter. Theſe arteries and veins detach branches into the Uretus and Fallopian tubes, and not only make communication betwixt the artery and vein on one ſide and thoſe of the other, but alſo with the proper veſſels of the Uterus detached from the internal iliac

Tab. xxix. 8.

Tab. xxix. 7.

Tab. xxix. 12.

Tab. xxix. 11.

arteries

arteries and veins. From theſe veſſels both arteries and veins in the inſide of the Uterus, the menſtrual purgations are made in women, and ſomething of the ſame kind in brutes, as often as they deſire coition. One uſe of theſe purgations is, to open the veſſels of the Uterus, for the veſſels of the Placenta to join to them. Many authors have imagined that there muſt be ſome evacuations analagous to this, in men, which I cannot ſee the neceſſity of; but on the contrary, I believe that men's not having ſuch evacuations, is the true reaſon why their bodies grow larger and ſtronger than womens; and their continuing to grow longer before they are fit for marriage, I alſo take to be the true reaſon why there are more males born than females, in about the proportion of thirteen to twelve; for women being ſooner fit for marriage than men, fewer will die before that time, than of men.

Tab.xxix. 9. NEAR the ſides of the Ovaria, are ſeated the Tubæ Fallopianæ, one end of which is connected to the Uterus, and the ſide to the Ovarium by a membrane, the other end being jagged, is called Morſus Diaboli. Among theſe jaggs is a ſmall orifice which leads into the tube, which near this end is about a quarter of an inch diameter, and thence growing gradually ſmaller paſſes to the Uterus, and enters there with an orifice about the ſize of a hog's briſtle.

Tab.xxix. 10.

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The uſe of theſe tubes is to convey the male ſeed from the Uterus to the Ovaria, to impregnate the eggs for conceptions; yet they are ſeemingly ſo ill adapted to this end, that many writers have ſuppoſed there muſt be ſome other paſſage from the Uterus to the Ovaria; but if we conſider the caſe of conceptions found in theſe tubes, and the exact analogy between theſe and the tube of a hen, where we have the moſt undeniable proofs of the ſeed going through the tube, and of the eggs being impregnated that way, and of the eggs coming from the Ovarium through the tube, and ſeemingly with much greater difficulty than in women; and beſides how frequently a matter like the male ſeed, (which I ſuppoſe is ſeed,) is found in the fallopian tubes of women, as I have found in executed bodies, and in a common whore that died ſuddenly, it appears almoſt certain, that the ſeed goes through the Fallopian tubes to the Ovaria to impregnate eggs, which come back through the ſame tubes to the Uterus. I have ſeen in a woman both the Fallopian tubes unperforated, which upon the foregoing hypotheſis, muſt have cauſed barrenneſs, and ſeed lodged in theſe tubes may have the ſame effect; which I take to be often the caſe of common whores, and women that uſe coition too frequently; and perhaps the fat in the membrane that connects the Ovaria

to

to the tubes, may in very fat women, ſo keep theſe tubes from the Ovaria as to interrupt impregnations; and beſides theſe caſes, too much or too little of the Menſes, may deſtroy or interrupt conceptions; but the latter caſe, eſpecially in young women is very rare. From ſuch cauſes as theſe, and not from imbecillity, I imagine it is that barrenneſs oftener proceeds from women than men; and though women do not propagate to ſo great an age as men, it is not, I believe, for want of being impregnated, but from their Menſes ceaſing, and thoſe veſſels being cloſed which ſhould nouriſh the Fœtus after the impregnation, as if on purpoſe to prevent the propagation of a feeble and infirm ſpecies. And from this conſideration one cannot but think that the perfection of the Fœtus, notwithſtanding it is firſt formed in the male ſeed, depends more upon the female than the male, or elſe that nature would, for the ſake of the ſpecies, have been careful to hinder men as well as women from propagating in a declining age

CHAP.

CHAP. III.

Of the Fœtus in Utero.

THE Fœtus in Utero is involved in two coats, viz. Chorion, which is external, and Amnion which immediately incloſes the Fœtus. They contain a quantity of liquor, which is a proper medium for ſo tender a being as the Fœtus to reſt in, and partly ſecures it from external injuries, as the aqueous humour does the cryſtaline in the eye; and when the membranes burſt at the time of production, this humour lubricates the Vagina Uteri, to render the birth leſs difficult. And ſeeing the ſtomach of a Fœtus in Utero is always full of a fluid like what is contained in the Amnion, and the guts always filled with excrements; is it not reaſonable to ſuppoſe that this fluid is frequently, during the time of geſtation, ſwallowed by the Fœtus, if not for nouriſhment, at leaſt to keep theſe parts in uſe, and to flow through the lacteals (as a quantity of blood from the right ventricle of the heart, flows through the lungs before the birth) to keep open thoſe paſſages 'till the birth, there being after that time no other way of receiving nouriſhment? And are not the Fæces found in the guts of a Fœtus chiefly thoſe parts of this

fluid that were taken in at the mouth, and were too groſs to enter the lacteals?

Besides theſe coats, in a cow and many other animals, we find another membrane called Allantois; it is incloſed by the Chorion together with the Amnion, and contains a large quantity of water which it receives from the bladder of urine by the Urachus. Its uſe ſeems to be to contain the urine that it might not by the common paſſage be emptied into the liquor of the Amnion, of which the Fœtus, I am inclined to think, is frequently drinking. Yet I own it takes off very much from the probability of the opinion of the Fœtus's imbibing this liquor, that, if I am rightly informed, ſome who have been born with mouths and noſtrils unperforate, have had ſuch fluids and excrements in the inteſtines that other Fœtus's have, which may indeed be derived from the ſalivary glands and from the liver, &c. The following curious paſſage was ſent me by Mr. Monro. "This liquor contributes nothing to the nou-"riſhment of the Fœtus for theſe reaſons; "firſt, becauſe, as you have well obſerved, "vaſt numbers of inſtances might be produ-"ced, where no paſſage was to be found for "it: I ſhall give you one I ſaw my ſelf in the "Hotel de Dieu at Paris in 1718.

"Mary Guerlin brought forth two children, "one a compleat girl, the other had neither

"head,

" head, neck, arms, heart, lungs, ſtomach,
" ſmall guts, liver, ſpleen, nor Pancreas, yet
" the great guts, the organs of urine and ge-
" neration of a female, and lower extremities
" were perfect, and of a natural growth; the
" umbilical vein, after entering the Abdomen
" ſplit into a great many branches, which were
" diſtributed to the ſeveral parts in its Abdo-
" men. Though it is true that ſoon after
" conception, the liquor in the Amnion, and
" that in the ſtomach of the Fœtus reſemble
" one another pretty near, yet afterward they
" differ exceedingly, for the liquor in the ſto-
" mach is ſtill gelatinous, thick, and without
" acrimony, while the other becomes thinner
" and more acrid; whereas, had the Fœtus
" conſtantly ſwallowed this liquor, the caſe
" would have been quite oppoſite; nay, often
" it has happened that theſe waters (as they
" are commonly called) have been found quite
" corrupted, ſtrongly fetid, and extreamly
" ſharp, while the Fœtus, except the injuries
" which the external parts received, was well
" and ſound; witneſs the example mentioned
" by Bellinger, of a woman who was cured of
" a virulent Gonorrhea during her going with
" child. And farther by Malpighius's deli-
" neations of the Pullus in Ovo, it appears
" to me evident that the Aſitellus ſerves the
" ſame purpoſe as the Placenta does in vivi-

"parous animals, to convey the Albumen "attenuated by incubation into the blood-"veſſels of the chick, and that none of the Al-"bumen does paſs through the Saccus Colli-"quamenti."

WHETHER an Alantois is to be found with a human Fœtus or no, anatomiſts are not all agreed, and I cannot give my opinion having never had a ſufficient opportunity to enquire. But children having an Urachus one cannot well doubt of the Alantois. I have been informed by a gentleman, whoſe probity I can ſufficiently rely on, that he had ſeen a child that had no external genital parts, and made water through the navel. At Henly upon Thames, there is now living a bargeman's child about ten years old, of which child I had the like account; but upon examination I found an unperforated Glans with its Frœnum immediately below the place of the navel, and the urine iſſued out by drops between this and the belly, in the place which I ſuppoſe was the navel, but it was ſo much excoriated, that I could make no certain judgment about it. In the Uterus of a cow with two calves, I found they had but one Chorion, but each an Amnion, and Allantois diſtinct, but the cotyledons which are analogous to the Placenta of the humane Fœtus, were pret-

ty

ty much in common to the umbilical blood veſſels of both.

The Placenta, or womb-liver, is a maſs of blood veſſels ſeated on the outſide of the Chorion, being compoſed of the extream branches of the umbilical-vein and arteries, which are for the compoſition of this part divided into exceeding ſmall branches to join a like number of the menſtrual veſſels of the Uterus, which veſſels of the Uterus are made numerous rather than large, that the ſeparation of the Placenta from them may not be attended with a flux of blood fatal to the mother; for the ſides of little veſſels ſoon collapſe and cloſe, and they are more eaſily ſtopped, being compreſſed by the Uterus it ſelf as it ſhrinks, which it begins to do from the time of the birth, but when the Placenta is ſeparated before the delivery, whether untimely or not, theſe veſſels bleed until the Uterus is diſcharged of the Fœtus. The figure of the Placenta is circular, and at its greateſt growth about two inches thick, and ſix or ſeven diameter.

The arteries and veins of the Uterus of the mother, by which the menſtrual purgations are made, are joined to the umbilical arteries and veins in the Placenta of the Fœtus, the arteries of the Uterus to the veins in the Placenta, and the veins in the Uterus to the arteries of the Placenta: By theſe veſſels a large quantity of

blood is continually flowing from the mother to the Fœtus and back again; but for what end ſuch a quantity flows continually and back again, I cannot conceive, unleſs it is that the Fœtus not breathing for it ſelf, it is neceſſary that as much blood of the mother ſhould flow continually to the Fœtus, as can leave enough air, or whatever our blood receives in the lungs for the Fœtus; and perhaps what nutritious juices the Fœtus receives, require a great deal of blood to convey them, they being but a ſmall part of the blood. The navel ſtring or umbilical blood-veſſels, between the Placenta and the navel, are about two foot long, that the Fœtus may have room to move without tearing the Placenta from the Uterus, which being done too ſoon, from whatever cauſe, occaſions a miſcarriage. Theſe veſſels, viz. two arteries and one vein twiſt about each other, particularly the arteries about the vein, and are contained in one common coat together with a veſſel called Urachus, which ariſes from the top of the bladder of urine, and ends in the
Tab.xxxi. 1. membrane Allantois; the umbilical vein goes from the navel directly into the liver, and there, enters the great trunk of the Vena Portæ.
Tab.xxxi. 2. Near which entrance, there goes out the Ductus Venoſus to the great trunk of the Cava, which
Tab.xxxi. 4. carries part of the blood that is brought by the umbilical vein, that way into the Cava, while the

the reſt circulates with the blood in the Porta, the whole of it not paſſing through the Ductus Venoſus as is generally believed, but a great part of it into branches of the Porta, in the liver, otherwiſe there need be no communication between the umbilical vein and the Porta; and when the umbilical vein is ſtopped, it becomes a ligament, and the Ductus Venoſus ſoon ſhrinks and almoſt diſappears, having no longer any blood flowing through it; and even the Porta it ſelf within the liver (from whence only blood could paſs after the birth into the Ductus Venoſus) has leſs blood flowing through it for ſome time than it had before the birth, it receiving much blood before the birth from the umbilical vein. The blood which flows from the mother to the Fœtus by the umbilical vein, is returned (all but a ſmall quantity, which is reſerved for nutrition) by the two umbilical arteries, which ariſe from the internal iliac arteries, and paſſing by the outſides of the bladder go directly to the navel and Placenta; theſe with the Urachus being ſhrunk up after the birth, loſe much of their appearance, eſpecially near the navel, where they are ſometimes not be diſtinguiſhed.

Tab. xxxi. 3.

PART of the blood before the birth and not the whole quantity as is generally thought, which is brought by the aſcending Cava to the right auricle, paſſes at once through the Fora-

men Ovale into the left auricle, and the reſt flows into the right ventricle with the blood of the deſcending Cava, and thence into the pulmonary artery, where about one half flows into the lungs, and the other half directly into the Aorta by the Ductus Arterioſus, which lies between the pulmonary artery, and the Aorta, which after the birth is called Ductus Arterioſus in Ligamentum Verſus. The better to explain this contrivance, I will call the quantity of blood flowing through the aſcending Cava in a given time four, and that which flows through the deſcending Cava two: Then let two of the quantity in the aſcending Cava flow into the right auricle, it will then with the two received from the deſcending Cava have the quantity four; which being thrown from the right ventricle into the pulmonary artery, the quantity two is thrown into the Aorta by the Ductus Arterioſus, and the ſame quantity into the lungs by the pulmonary branches; then the quantity returning from the lungs to the left auricle, will be two in the ſame given time, which being added to the two which flowed through the Foramen Ovale, in the ſame time there will be conſtantly the ſame proportions received into each ventricle at every Diaſtole of the ventricles as after the birth. Now if the blood flowing through the aſcending Cava joined by that from the umbilical vein, was but

equal to that flowing through the deſcending, let each of them be called two, and let all the blood of the aſcending Cava go through the Foramen Ovale; then the blood which the left ventricle would receive, would exceed that which flows into the right, by the whole quantity which flows from the lungs in the ſame time; but the aſcending Cava conveying more blood than the deſcending Cava, the exceſs in the left ventricle would be yet greater. If the proportions which I have taken for the eaſier computing were perfectly right, as I am ſure they are nearly, then the quantity flowing into the left ventricle, would be to that flowing into the right at the ſame time as five to two, if all the aſcending blood went through the Foramen Ovale.

And though after the birth the left ventricle of the heart is only employed in throwing blood into the Aorta, and the right wholly employed in circulating the blood through the lungs; yet before the birth all the blood thrown out by the left ventricle, and about half the blood thrown out of the right ventricle, being thrown into the Aorta, and the other part only through the lungs, it follows that the whole force exerted by the left ventricle, with about half that of the right, is employed in throwing blood into the Aorta, while that diſtributes blood through the whole Fœtus and to the mother

ther: But after the birthwhen the blood is to be no longer carried from the Fœtus to the mother, the left ventricle becomes ſufficient for the circulation through the Fœtus, and a new occaſion immediately ariſes for that additional power, which before was neceſſarily employed in throwing blood into the Aorta; for the whole maſs of blood now being to be circulated through the lungs, the Ductus Arterioſus cloſes, and the right ventricle muſt throw all the blood it receives into the lungs, there being no longer any paſſage into the Aorta. It is ſuppoſed that the inflation of the lungs at the birth, preſently alters the poſition of the Ductus Arterioſus, ſo as to obſtruct it; which account is indeed mechanical, but I think not true, becauſe I can neither diſcern that the poſition of this veſſel is altered, nor its ſurface compreſſed: But I rather think that immediately upon the birth, there being no blood carried off from the Fœtus to the mother, and the left ventricle being ſufficient to fill the Aorta and its branches with blood, as I have ſhewn before, there is no longer room for any blood from the right ventricle; wherefore the blood from the right ventricle will be forced into the lungs, where the paſſage is now made eaſy, as I imagine, by their being inflated; and the Ductus Arterioſus, having the blood no longer forced into it, ſhrinks, and in time almoſt

moſt diſappears. This duct being ſtopped, the valve of the Foramen Ovale immediately ſtops that paſſage, it being on the ſide of the left auricle (or that muſcular bag, which is the largeſt part of that auricle) which is much the ſtrongeſt, muſt at all times be preſſed more on that ſide than the other by the blood in the time of the Syſtole of the auricle; and it is as evident that in the Diaſtole of the auricle, there muſt be more preſſure to open that than the right, it being a ſtronger muſcle, or elſe there could have been no reaſon for having the left auricle ſtronger than the right in proportion to their ventricles. Sometimes this valve does not quite cover the Foramen, in which caſe a ſmall quantity of blood may poſſibly flow from the left auricle to the right, and ſo circulate twice through the lungs to once through the body, but none could flow from the right to the left and eſcape the lungs, which might be of bad conſequence. Some have imagined, that men who have this paſſage open, cannot be drowned: But though this paſſage is ſometimes found open, no Man has been yet ſeen, that we have ever heard of, that could not be drowned. I have ſeen the Foramen open in a man that was hanged, to whom one might juſtly expect it ſhould have been as uſeful as in the caſe of ſubmerſion in water. Many writers have ſuppoſed that this Foramen is open in amphibious

phibious animals, and in ſuch fiſhes as have two auricles, two ventricles, and lungs like land animals, without gills (which in other fiſh are analogous to lungs.) I have diſſected a porpus which is of this kind, and found this Foramen cloſed; but the great veins were vaſtly large in proportion to the bulk of the animal; whence I conjectured their blood was accumulated in their veins, while they kept under water, and by that means the lungs eſcaped being oppreſſed with blood; which conjecture ſeemed to me the more probable, ſince all animals of this kind are able to abide the leaſt time under water, when their blood is moſt expanded with heat. But upon the diſſection of an otter, whoſe Foramen Ovale was alſo cloſed, I found the veins nothing differing from thoſe of other animals. In a water tortoiſe which I had an opportunity of examining, with that moſt dextrous and indefatigable anatomiſt Dr. Douglaſs, I found the two ventricles of the heart but half divided by a Septum, and in the beginning of the pulmonary artery ſeveral ſtrong muſcular rings, a little diſtance from each other, each of which by contracting, would be capable of reſiſting a part of that blood, which otherwiſe would have been thrown into the lungs, when they were under water; and this blood ſo obſtructed muſt neceſſarily be thrown into the Aorta, the two ventricles being in a manner one

one common cavity; and when they are out of the water, this communication of ventricles, will ſuffer but little confuſion of the blood which flows into the ventricles, becauſe each ventricle receiving and diſcharging the ſame quantity of blood, at the ſame time, they will balance each other, and thereby ſuch a mixture will be very much prevented. Mr. Monro obſerves that the water tortoiſe has very large lungs, conſiſting of larger veſicles than land animals, and that they receive a greater quantity of air to furniſh that Je ne ſçai quoi ſo neceſſary for the life of animals: The ſame thing I remember to have obſerved in frogs.

As to the reaſon of womens bringing forth at the uſual time; it has been ſaid, that at that time, the head of the child begins to be ſpecifically heavier than the reſt of the body, and therefore muſt fall loweſt in the fluid it lies in; which being an uneaſy poſture, makes the child ſtruggle, and bring on the labour. But it is not true, that the head then alters its ſpecific gravity; or if it did, there is ſeldom fluid enough in the Amnion for this purpoſe; and beſides, this could only happen right in one poſture, and would always happen wrong in brutes.

CHAP.

CHAP. IV.

Of the eye.

THE figure, ſituation, and uſe of the eyes, together with the eye-brows, eye-laſhes, and eye-lids, being well known, I think, I need only deſcribe what is uſually ſhewn by diſſecting. The orbit of the eye, or cavity in which it is contained, is in all the vacant places filled with a looſe fat, which is a proper medium for the eye to reſt in, and ſerves as a ſocket for it to be moved in. In the upper and outer part of the orbit, is ſeated the lacrymal gland. Its uſe is to furniſh at all times water enough to waſh off duſt and to keep the outer ſurface of the eye moiſt, without which the Tunica Cornea would be leſs pellucid, and the rays of light would be diſturbed in their paſſage; and that this liquor may be rightly diſpoſed of, we frequently cloſe the eye-lids to ſpread it equally, even when we are not conſcious of doing it. At the inner corner of the eye, between the eye-lids, ſtands a caruncle, which ſeems to be placed to keep that corner of the eye-lids from being totally cloſed, that any tears or gummy matter may flow from under the eye-lids, when we ſleep, or into the Puncta Lacrymalia, which are little holes, one in each eye-lid,

eye-lid, near this corner, to carry off into the Ductus ad Nasum, any superfluous tears.

THE first membrane of the eye is called Conjunctiva, it covers so much of the eye as is called the white, and being reflected all round it lines the two eye-lids; it being thus returned from the eye to the inside of the eye-lids; it effectually hinders any extraneous bodies, from getting behind the eye, into the orbit, and smooths the parts it covers, which makes the friction less between the eye and the eye-lids. This coat is very full of blood vessels, as appears upon any inflammation.

TUNICA SCLEROTIS, and CORNEA, make together one firm case of a proper form, for the use of the other coats and humours. The fore part of this strong coat being transparent, and like horn, is called Cornea, and the rest Sclerotis. Under the Cornea lies the Iris which is an opake membrane, like the Tunica Choroides, but of different colours in different eyes, such as the eye appears, as grey, black, or hazel, for it being seated under the Tunica Cornea, it gives such an appearance to that as it has its self. The middle of it is perforated for the admission of the rays of light, and is called the pupil. Immediately under the Iris lie the Processus Ciliares, like radial lines from a lesser circle to a greater. When these processes contract they dilate the pupil to suffer more

rays of light to enter into the eye; and the contrary is done by the circular fibres of the Iris, which act as a ſphincter muſcle: But theſe changes are not made with great quickneſs, as appears from the eyes being oppreſſed with a ſtrong light, for ſome time after we come out of a dark place, and from the contrary effect in going ſuddenly from a light place to a dark one. And as the pupil always dilates in darker places, to receive more rays of light, ſo when any diſeaſe makes ſome of thoſe rays ineffectual, which paſs through the pupil, it dilates as in dark places to admit more light; therefore a dilated pupil is a certain ſign of a bad eye, and this may be diſcerned uſually ſooner than the patient diſcerns any defect in viſion. In men the pupil is round, which fits them to ſee every way alike; it is alſo round in animals that are the prey both of birds and beaſts. But graminivorous brutes that are too large to be the prey of birds, have it oblong horizontally, which fits them to view a large ſpace upon the earth; while animals of the cat-kind who climb trees, and prey indifferently on birds or animals that hide in the earth, have their pupils oblong the contrary way, which fits them beſt to look upward and downward at once. Beſides theſe there are other animals whoſe pupils are in theſe forms, but in leſs proportions, ſo as beſt to fit their ways of life. Immediately

diately under the Sclerotis, is a membrane of little firmneſs called Choroides; in men it is of a ruſty dark colour, ſuch as will bury almoſt all the rays of light, that paſs through the Tunica Retina, which if it were of a brighter colour, would reflect many of the rays upon the Retina, and make a ſecond image upon the firſt ſomewhat leſs, and leſs diſtinct, but both together ſtronger; which is the caſe of brutes of prey, where a great part of this coat is perfectly white, which makes them ſee bodies of all colours in the night better than men, for white reflects all colours: But brutes that feed only on graſs, have the ſame parts of this membrane of a bright green, which enables them alſo to ſee with leſs light, and makes graſs an object that they can diſcern with greateſt ſtrength: But theſe advantages in brutes, neceſſarily deſtroy great accuracy in viſion, which is of little or no uſe to them, but to men of great conſequence. This green part of the Tunica Choroides, in animals that graze, may properly be called Membrana Uvea, from its reſemblance in colour, to an unripe grape. But in men's eyes, only a white circle round the back ſide of the Choroides near the Cornea, is called Uvea.

Immediately under the Tunica Choroides, lies the Tunica Retina, which is the optic nerve expanded and co-extended with the Choroides. Rays of light ſtriking upon

 this

this membrane, the ſenſation is conveyed by the optic nerves, to the common Senſorium the brain; theſe nerves do not enter at the middle of the bottom of the eyes, but nearer the noſe; for thoſe rays of light being ineffectual for viſion that fall upon the entrance of the optic nerves, it is fit they ſhould ſo enter, as that the ſame object, or part of any object, ſhould not be unperceived in both eyes, as would have been the caſe, had they been otherwiſe inſerted; which appears from a common experiment of part of an object being loſt to one eye, when we are looking towards it with the other ſhut. I know a gentleman who having loſt one eye by the ſmall-pox, and going through a hedge a thorn unſeen (probably from this cauſe) ſtruck the other and put it out. The two optick nerves ſoon after they ariſe out of the brain join and ſeem perfectly united, yet from the following caſe, I am not without ſuſpicion of their fibres being preſerved diſtinct, and that the nerve of each eye, ariſes wholly from the oppoſite ſide of the brain, or elſe that the other nerves throughout the body ariſe from the brain, and Medulla Oblongata on the ſides oppoſite to thoſe they come out of. A ſoldier who was my patient in the hoſpital about five years ſince, had, by a puſh with a broad ſword, his left eye raiſed out of the orbit, which I replaced with my fingers; it was preſently

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ſently

ſently followed with exceſſive pain in the right ſide of the head only, and a loſs of the ſenſe of feeling and motion in both the right limbs; the ſenſe of feeling he recovered by degrees in about a month, and ſoon after began to recover their motion, but was about twelve months before he could walk, and lift up his hand to his head; and in about two years recovered all but the ſight of the wounded eye, which indeed did not appear perfect. In fiſh theſe nerves ariſe diſtinct from the oppoſite ſides of the brain, and croſs without uniting; but as theſe animals have their eyes ſo placed, as not to ſee the ſame object with both eyes at once, whereas animals whoſe optic nerves ſeem to unite, do ſee the ſame object with both eyes at once, one would ſuſpect that in one they were joined to make the object not appear double; and in the other diſtinct, to make their two eyes (as they are to view different objects at the ſame time) independent on each other; and yet from the following caſes, the ſeeing objects ſingle ſeems not to depend upon any ſuch union, nor from the light ſtriking upon correſponding fibres of the nerves, as others have believed, but upon a judgment from experience, all objects appearing ſingle to both eyes in the manner we are moſt uſed to obſerve them, but in other caſes double; for though we have a diſtinct image from each eye ſent to

 the

the brain, yet while both theſe images are of an object ſeen in one and the ſame place, we conceive of them as one, ſo when one image appears to the (eyes when they are diſtorted or wrong directed) in two different places, it gives the idea of two; and when two bodies are ſeen in one place, as two candles rightly placed, through one hole in a board, they appear one. But caſes of this kind being too numerous, I will conclude with one very remarkable, and I think much in favour of this opinion. A gentleman who, from a blow on the head, had one eye diſtorted, found every object appear double, but by degrees the moſt familiar ones became ſingle, and in time all objects became ſo, without any amendment of the diſtortion.

THE inſide of the eye is filled with three humours, called aqueous, cryſtalline and vitreous. The aqueous lies foremoſt, and ſeems chiefly of uſe to prevent the cryſtalline from being eaſily bruiſed by rubbing or a blow, and perhaps it ſerves for the cryſtalline humour to move forward in while we view near objects, and backward for remoter objects; without which mechaniſm, or in the place of it a greater convexity in the cryſtalline humour in the former caſe, and a leſs convexity in the latter, I do not imagine, according to the laws of optics, how we could ſo diſtinctly ſee objects at different diſtances. However it is in land animals,

mals, I think we may plainly ſee, that fiſh move their cryſtalline humour, nearer the bottom of the eye when they are out of water, and the contrary way in water; becauſe light is leſs refracted from water through the cryſtalline humour than from air. Some have ſaid, that amphibious animals have a membrane like the Membrana Nictitans of birds, which ſerves them as a Lens in the water. I have examined the eye of a crocodile, which Sir Hans Sloan keeps in ſpirits, and I found this membrane equally thick and denſe, and conſequently unfit for this purpoſe, or I believe any other except that obvious one, of defending the eye from the water. Next behind the aqueous humour lies the cryſtalline; its ſhape is a depreſſed ſpheroid, it is diſtinctly contained in a very fine membrane called Aranea. The uſe of this humour is to refract the rays of light which paſs through it, ſo that each pencil of rays from the ſame point of any object, may be united upon the Retina (as in a Camera Obſcura) to make the ſtronger impreſſion; and though by this union of the rays a picture inverted is made upon the Retina, yet ſurely it is the impulſe only of the rays upon the Retina, that is the cauſe of viſion; for had the colour of the Retina been black, and conſequently unfit to receive ſuch a picture, would not the impulſe of light upon it have been ſufficient for viſion? Or would ſuch a pic-

ture, if it could have been made without any impulse, have ever conveyed any sensation to the brain? Then if the impulse of light upon the Retina, and not the image upon the Retina, is the cause of vision; when we enquire why an image inverted in the eye appears otherwise to the mind, might we not expect to find the true cause from considering the directions in which the rays strike the Retina, as we judge of above and below from a like experience, when any thing strikes upon any part of our bodies; nevertheless in viewing an object through a Lens, we conceive of it as inverted, whenas in receiving the impulses of light in the same manner, and having the picture on the Retina in the same attitude, when we stand on our heads without the lens, we have not the same, but the contrary idea of the position of the object. Though I have considered this humour only as a refractor of light, yet the first and greatest refraction is undoubtedly made in the Cornea; but it being Concavo-convex, like glasses of that kind, while one side makes the rays of light converge, the other diverges them again. The same thing also may be observed of the aqueous humour, which is indeed more concave than convex; but when the crystalline humour is removed in the couching a cataract the aqueous possesses its place and becomes a Lens; but that refracting light less than the crystalline,

cryſtalline, whoſe place and ſhape it partly takes, the patient needs a convex glaſs to ſee accurately. In ſome eyes either this humour being too convex or too diſtant from the Retina, the rays unite too ſoon unleſs the object is held very near to the eye, which fault is remediable by a concave glaſs, as the contrary fault (common to old perſons) is by a convex glaſs. Here it may not be improper to obſerve, how wiſely providence has fixed the diſtance, at which we ordinarily ſee objects beſt; for if the eye had been formed for a nearer view, the object would often obſtruct the light; if it had been much farther, light enough would not commonly have been produced from the object to the eye. In fiſh the cryſtalline humour ſeems a perfect ſphere, which is neceſſary for them, becauſe light being leſs refracted from water through the cryſtalline humour than from air, that defect is compenſated by a more convex Lens. The vitreous humour lies behind the cryſtalline, and fills up the greateſt part of the eye: Its foreſide is concave for the cryſtalline humour to lodge in, and its backſide being convex the Tunica Retina is ſpread over it; it ſerves as a medium to keep the cryſtalline humour and the Retina at a due diſtance.

THE larger animals having larger eyes, their organs of viſion (like a microſcope with a large

Lens) are fit to take in a greater view, but in that view things are not ſo much magnified; ſo in the leſſer animals a ſmall ſpace is diſcerned, ſuch as is their ſphere of action, but that greatly magnified, not really ſo in either caſe, but comparatively; for viſion ſhews not the real magnitude of objects, but their proportions one to another. Fiſh have their eyes, and particularly their pupils, larger than land animals, becauſe there is leſs light, and that not ſo far diſtributed in water as in the air.

CHAP. V.

Of the ear.

THE figure and ſituation of the outer ear, needs no deſcription. Its inner ſubſtance is cartilage, which preſerves its form without being liable to break: Its uſe is to collect ſounds, and direct them into the Meatus Auditorius, which is the paſſage that leads to the drum; this paſſage is lined with a glandular membrane, in which alſo is ſome hair; the Cerumen which is ſeparated by theſe glands, being ſpread all over this membrane, and its hairs, ſerve to defend the membrane from the outer air, and to entangle any inſect that might otherwiſe get into the ear. Sometimes this wax being

ing ſeparated in too great quantity, it fills up the paſſage and cauſes deafneſs; and thoſe great diſcharges of matter from the Meatus Auditorius, which are commonly called impoſtumes in the ear, I think can be nothing elſe than ulcerations, or great ſecretions from theſe glands. At the farther end of the Meatus Auditorius lies the drum, which is extended upon a bony ridge almoſt circular: Its ſituation in men and brutes is nearly horizontal, inclined towards the Meatus Auditorius, which is the beſt poſition to receive ſounds; the greateſt part of which being ordinarily reverberated from the earth. In its common ſituation in men and brutes, it is concave outward, but in birds it is convex outward, ſo as to make the upper ſide of it nearly perpendicular to the horizon, which ſerves them better to hear each others ſounds when they are high in the air, where they can receive but little reverberated ſound. This membrane does not entirely cloſe the paſſage, but has on one ſide a ſmall aperture covered with a valve. I found it once half open in a man that I diſſected, who had not been deaf, and I have ſeen a man ſmoak a whole pipe of tobacco out through his ears, which muſt go from the mouth, through the Euſtachian tube, and through the Tympanum, yet this man heard perfectly well. Theſe caſes occaſioned me to break the Tympanum in both ears of a dog,

dog, and it did not deſtroy his hearing, but for ſome time he received ſtrong ſounds with great horror. And that moſt excellent anatomiſt Mr. St. Andre, to whom I am greatly obliged in this chapter, has aſſured me, that a patient of his had the Tympanum deſtroyed by an ulcer, and the auditory bones caſt out, without deſtroying his hearing. In very young children I have always found this membrane covered with Mucus, which ſeems neceſſary to prevent ſounds from affecting them too much, there being no proviſion to ſhut the ears, as there is for the eyes. A gentleman well known in this city, having had four children born deaf, was adviſed to lay bliſters upon the heads of the next children he might have, which he did to three which were born afterward, and every one of them heard well. It ſeems not unreaſonable to ſuppoſe that too great a quantity of this Mucus upon the drum, might be the cauſe of deafneſs in the four children, and that the diſcharge made by the bliſters in the latter caſes, was the cauſe of their eſcaping the ſame misfortune.

Into the middle of the Tympanum is extended a ſmall bone called Malleus, whoſe other end is articulated to a bone called Incus, which is alſo articulated by the intervention of an exceeding ſmall one called Orbiculare, to a fourth bone called Stapes. Theſe bones

are contained in that cavity behind the Tympanum, which is called the barrel of the ear; but ſome anatomiſts call the barrel only Tympanum, and the membrane Membrana Tympani. The Malleus being moved inward by the Muſculus Obliquus Internus, or Trochlearis, it extends the Tympanum that it may be the more affected by the impulſe of ſounds when they are too weak. This muſcle ariſes from the cartilaginous part of the Euſtachian tube, and paſſing from thence in a proper groove, it is reflected under a ſmall proceſs, and thence paſſes on perpendicular to the Tympanum, to be inſerted into the handle of the Malleus, ſometimes with a double tendon. Parallel to this muſcle lies another Extenſor of the Tympanum, called Obliquus Externus; it ariſes from the outer and upper part of the Euſtachian tube, and paſſing through the ſame hole with the Corda Tympani, which is a branch of the fifth pair of nerves, it is inſerted into a long proceſs of the Malleus: This is not ſo obvious an Extenſor as to be known to be ſo, without an experiment. The muſcle which relaxes this membrane is called Externus Tympani; it ariſes from the upper part of the auditory paſſage under the membrane which lines that paſſage, and is inſerted into the upper proceſs of the Malleus. The relaxation of the Tympanum is made by this muſcle, without our knowledge,

ledge, when ſounds are too ſtrong; and as the pupil of the eye is contracted, when we have too much light, and dilated where there is too little, from what cauſe ſoever, ſo when ſounds are too low, or the ſenſe of hearing imperfect, from whatever cauſe, the extenſors of the Tympanum ſtretch it, to make the impulſe of ſounds more effectual upon it, juſt as in the caſe of the common drum, and the cords of any muſical inſtrument. From the cavity behind the Tympanum, which is called the barrel of the ear, goes the Euſtachian tube, or Iter ad Palatum; it ends cartilaginous behind the palate. This paſſage ſeems to be exactly of the ſame uſe with the hole in the ſide of the common drum, that is to let the air paſs in and out from the barrel of the ear, to make the membrane vibrate the better, and perhaps in the ear (which is cloſer than a common drum) to let air in or out as it alters in denſity, and if any fluid ſhould be ſeparated in the barrel of the ear to give it a paſſage out. This paſſage being obſtructed, as it is ſometimes, by a large Polypus behind the Uvula, it cauſes great difficulty of hearing, and ſometimes, when the Meatus Auditorius is obſtructed, a man opening his mouth wide, will hear pretty well through this paſſage, which is often ſo open as that ſyringing water through the noſe, it ſhall paſs through into the barrel of the ear and cauſe deafneſs for ſome time.

If

If any one would try how he can hear this way, let him ſtop his ears, and take between his teeth the end of a wire, or cord that will vibrate well, and holding the other end, ſtrike it, and the ſound that he hears will be through this paſſage. To the Stapes there is one muſcle called Muſculus Stapedis; it lies in a long channel, and ending in the Stapes, it ſerves to pull the Stapes off of the Feneſtra Ovalis, which otherwiſe it covers. Beſides the Feneſtra Ovalis, there is another near it ſomewhat leſs, called Rotunda; theſe two holes lead to a cavity called Veſtibulum, which leads into other cavities aptly called Cochlea, and three ſemicircular canals or altogether the labyrinth, in which are ſpread the auditory nerves to receive and convey the impulſe of ſounds, to the common Senſorium the brain; and ſurely the Chorda Tympani, which is a branch of the fith pair of nerves may alſo convey theſe ſenſations to the brain. The two holes called Feneſtra Ovalis & Rotunda, are cloſed with a fine membrane like the membrane called the drum, and the larger being occaſionally covered and uncovered by the Stapes, ſounds are thereby made to influence more or leſs, as beſt ſerves for hearing, and this advantage, being added to that of a lax or tenſe Tympanum, the effect of ſounds may be greatly encreaſed or leſſened upon the auditory nerves, expanded in the labyrinth. In the

ſtrongeſt ſounds; the Tympanum may be lax, and the Feneſtra Ovalis covered, and for the loweſt the Tympanum tenſe and the Feneſtra uncovered. If ſounds propagated in the air were heard leſs, we might often be in danger before we were apprized of it, and if the organs of hearing were much more perfect, unleſs our underſtandings were ſo too, we ſhould commonly hear more things at once than we could attend to.

CHAP. VI.

Of the ſenſes of ſmelling, taſting and feeling.

THE ſenſe of ſmelling is made by the Effluvia, which are conveyed by the air to the nerves, ending in the membranes which line the noſe and its Lamellæ. In men theſe Lamellæ are few, and the paſſage through the noſe not difficult; hence fewer Effluvia will ſtrike the nerves, than in animals of more exquiſite ſmell, whoſe noſes being full of Lamellæ, and the paſſage for the air narrow and crooked, few of the Effluvia eſcape one place or another, beſides their olfactory nerves may be more ſenſible. Fiſh, though they have no noſes, yet in their mouths they may taſte Ef-

fluvia in the water, as surely those fish do, who seek their prey in the darkest nights, and in great depths of water, there being more nerves disposed in their mouths, than through their whole bodies beside, the optic excepted; and it looks as if it was done for this purpose; for the mere sense of tasting, is ordinarily less curious in them, than in land animals; in baiting eel baskets, if the bait has lain long in water, it is seldom taken, but upon scarifying it afresh, which will make it emit new effluvia, it serves as a fresh bait.

The sense of tasting is made in the like manner upon the nerves, which line the mouth, and so is that of feeling upon the nerves, distributed throughout the body; of which, I should speak largely in this place, if I had not done it already in the chapter of the nerves.

TABLE

TABLE XXVII.

The urinary and genital parts of a man.

1. ARTERIA Aorta Defcendens.
2. Vena Cava Afcendens.

3, 3. The emulgent veins.

4, 4. The emulgent arteries.

5. The left kidney.
6. The emulgent vein taken out of the right kidney.

7, 7. Glandulæ Renales.

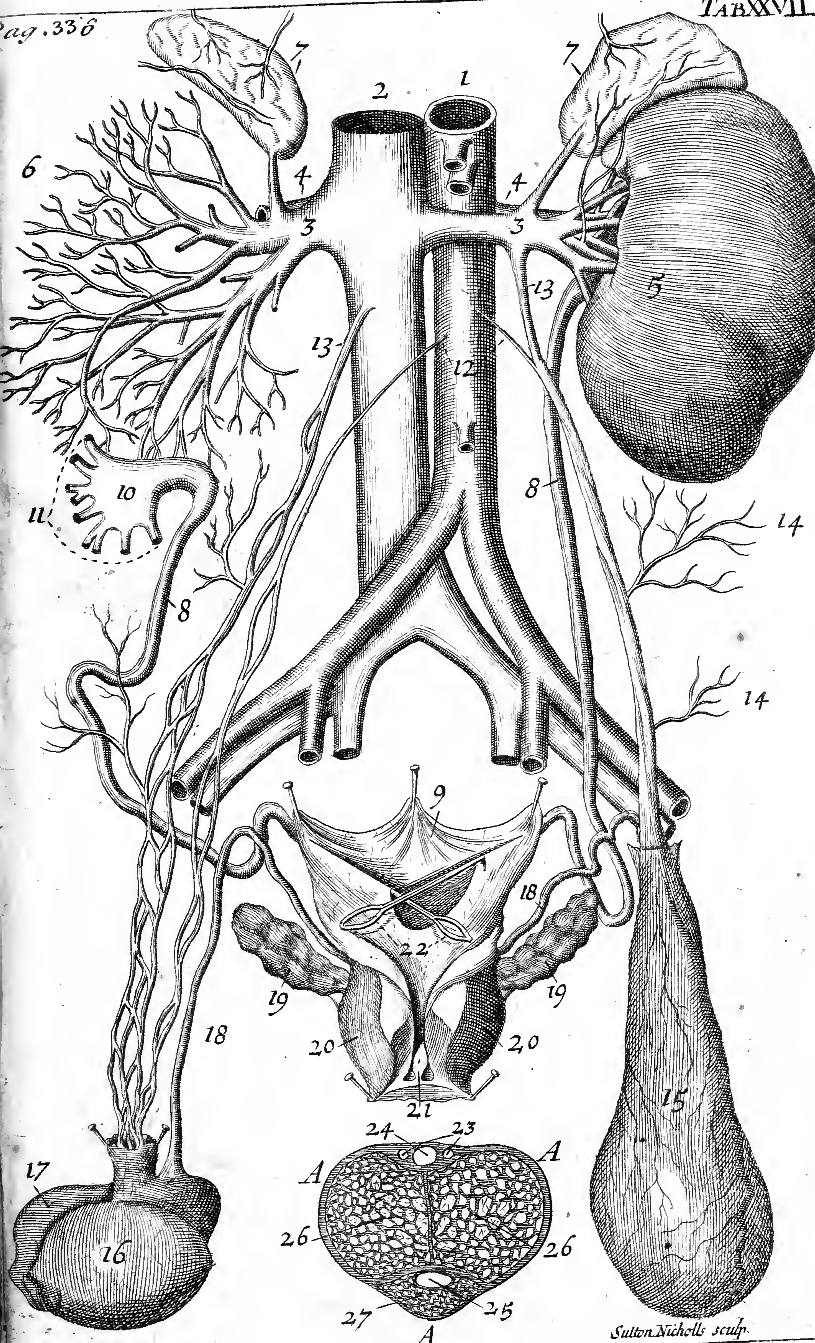
8, 8. The Ureters.

9. Part of the bladder of urine.
10. The Pelvis of the right Ureter taken out of the kidney.
11. The Tubuli Urinarii taken out of the right kidney.
12. The fpermatic arteries.
13. The fpermatic veins, the right entering the Cava, and the left the emulgent.

14, 14. Collateral branches of the fpermatic vein, which on this fide are not laid bare, and feparated from the artery which runs in the fame membrane with it.

15. The left tefticle included in the Proceffus Vaginalis or Elythroides.
16. The right tefticle denuded.

17. The



Sutton Nicholls sculp.

17. The right Epididymis.
18, 18. The Vaſa Deferentia.
19, 19. The Veſiculæ Seminales.
20, 20. The Proſtatæ.
21. The Roſtrum Gallinaginis in the Urethra.
22. Two probes put into the ureters, to ſhew their oblique paſſage into the bladder of urine.
A, A, A tranſverſe ſection of the Penis prepared with Mercury.
23. The two arteries of the Penis.
24. The Vena Ipſius Penis.
25. The Urethra.
26, 26. The Corpora Cavernoſa Penis.
27. The Corpora Cavernoſa Urethræ.

TABLE XXVIII.

A, THE testicle of a rat.

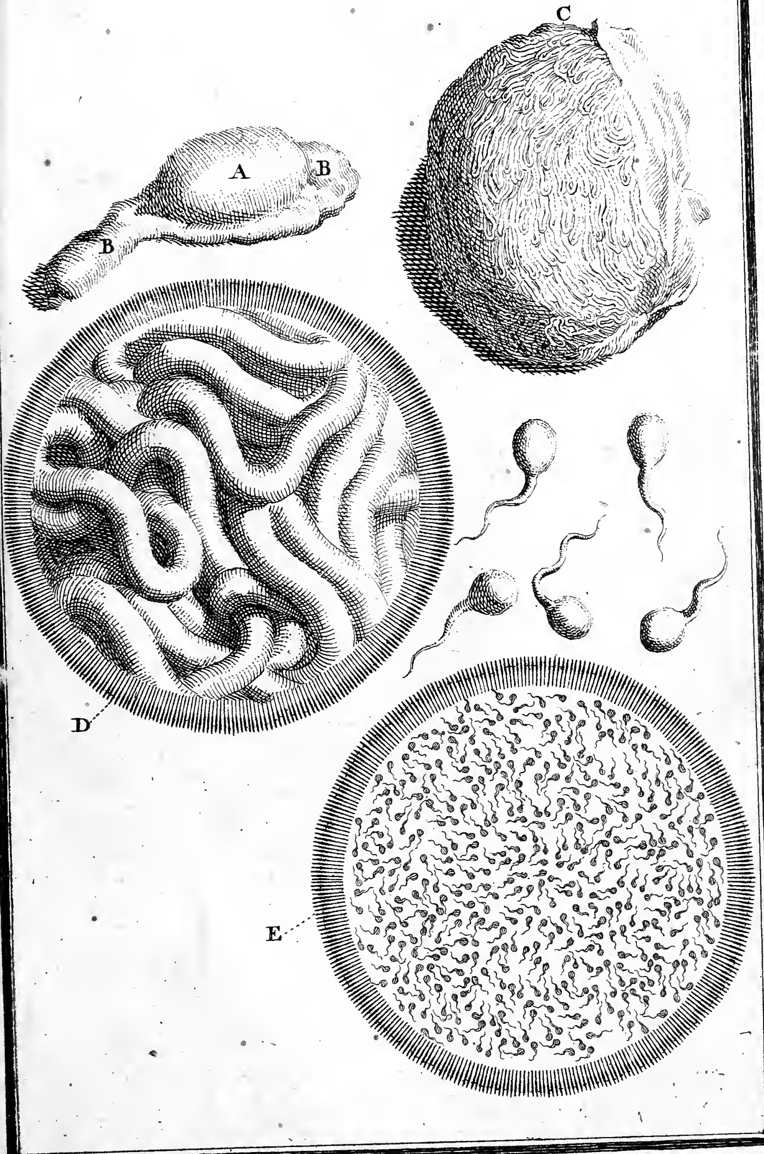
B, B, The Epididymis.

C, The same testicle divested of the Tunica Albuginea, and magnified to shew the Convolutions of the vessels.

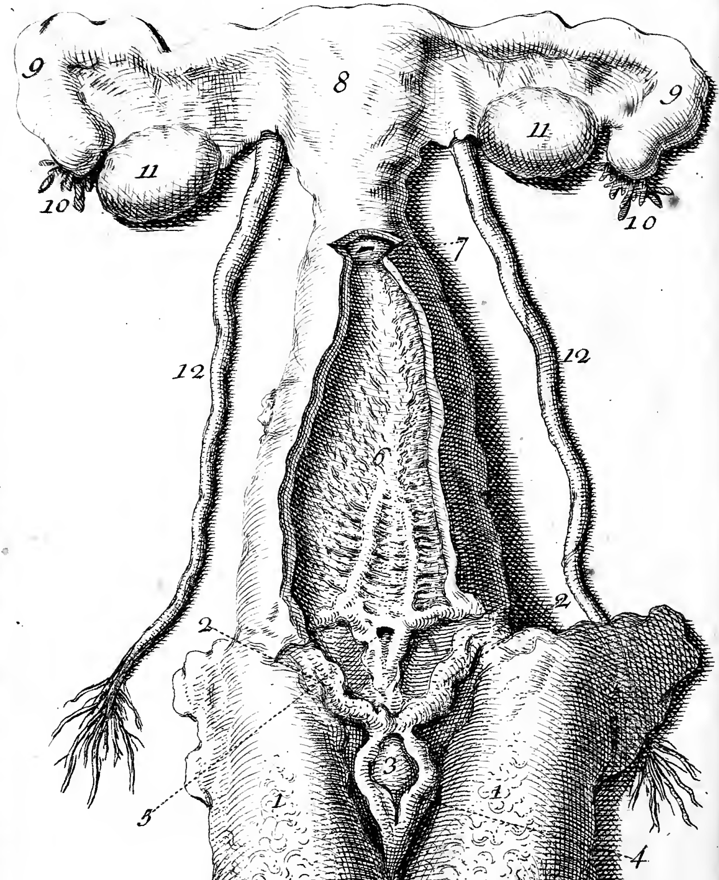
D, An inward portion of the same testicle more magnified.

E, A Group of Animalculæ, as they appear in the male seed in a microscope, and five other besides more magnified, but not represented enough like Tadpoles.

TAB. XXVIII



TAB. XXIX



I. v.d. Gucht Sculp.

TABLE XXIX.

THE parts of generation in women, the lower ſide of the Vagina being laid upward, and cut open.

1, 1. The Labia.

2, 2. The Nymphæ.

3. The Glans of the Clitoris extreamly large.

4. The Præputium of the Clitori.

5. The orifice of the Meatus Urinarius.

6. The inſide of the Vagina where the Rugæ are to be ſeen.

7. Os Tincæ.

8. Uterus.

9, 9. Tubæ Fallopianæ.

10, 10. Fimbriæ.

11, 11. Ovaria.

12, 12. Ligamenta Rotunda.

TABLE XXX

REPRESENTS the parts of an hermophradite, in which appeared as much of the mixture of the ſexes as could be; (but Dr. Douglas, to whom I am obliged for this cut, and the references, eſteems it a female.) I once examined another, in which I found a divided Scrotum juſt like the Labia Pudendi, with teſticles in it, and a urinary paſſage between them, with a perfect Clitoris as large as a Penis, with an exceeding ſmall Urethra, through which came a little urine.

FIGURE I.

1. The Clitoris covered with its Præputium.
2, 2. The two Labia Pundendi.

FIGURE 2.

3. The Clitoris covered with its Præputium.
4. The Glans of the Clitori.
5. 5. The Nymphæ.
6. 6. The Labia turned back, to ſhew the entrance into the Vagina marked 7.
8. The Furca Virginalis, or the ſkin that joins the two Labia at their lower part.

TAB XXX.

Fig. I.

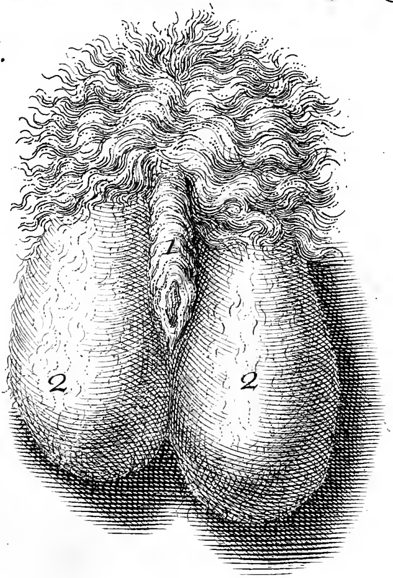
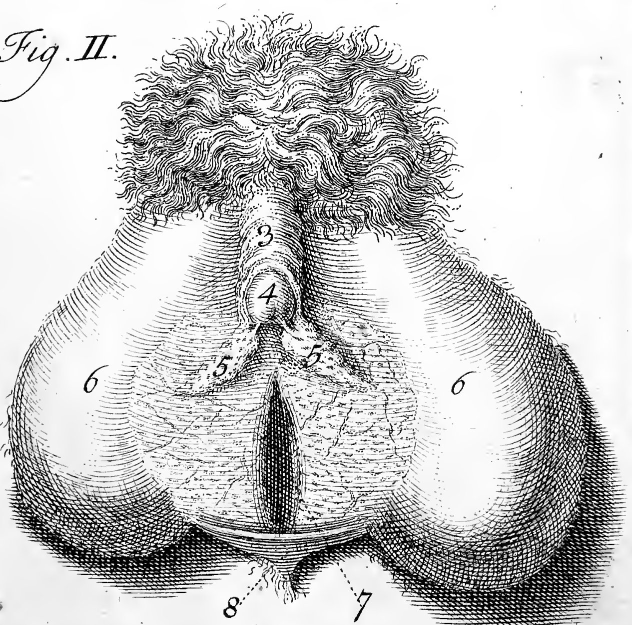
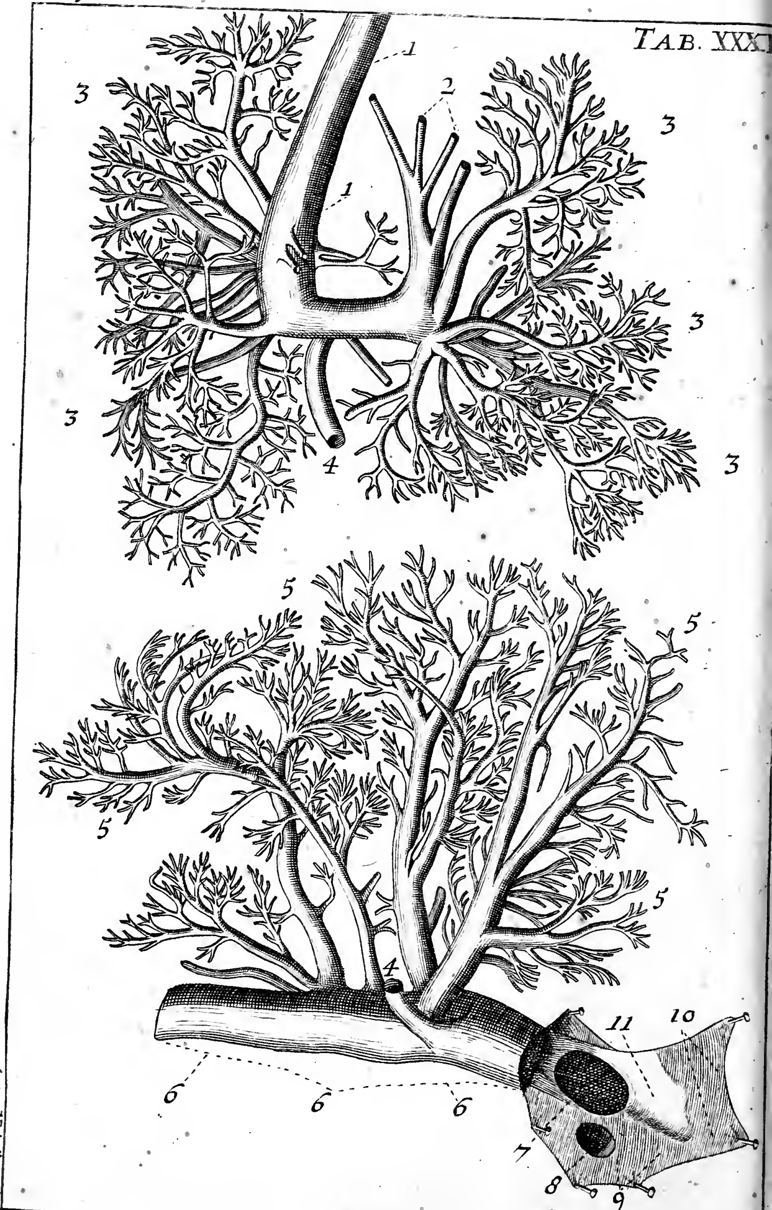


Fig. II.



V.dr Gucht Sculp:

TAB. XXXI



Sutton Nicholls sculp.

TABLE XXXI.

The vessels of the liver, &c. of a Fœtus, filled with wax.

1, 1. The umbilical vein.
2. Branches of the Vena Portæ.
3, 3, &c. The exream branches in the liver.
4, 4. The Ductus Venosus.
5, 5, &c. The extream branches of the Cava in the liver.
6, 6, 6. The ascending Vena Cava.
7. The Foramen Ovale.
8. The mouth of the coronary veins.
9. Part of the right auricle of the heart.
10. Part of the descending Cava.
11. Tuberculum Loweri.

TABLE XXXII

SHEWS how all the rays that flow from any point of any object, through the pupils of the eyes, are refracted by the cryſtalline humour, to meet in a Focus upon the Retina; the two dark cones ſhew the ſpaces where any object being placed, it is not perceived in that eye in which the cone ends; becauſe all the rays of light from an object ſo placed, fall upon the entrance of the optic nerve in that eye. (Vid. page 243.) Theſe cones divaricating as they proceed from the eyes, they can never coincide, and conſequently, though an object may be from this cauſe undiſcerned by one eye, there is no place from which it will be upon this account undiſcerned by the other eye.

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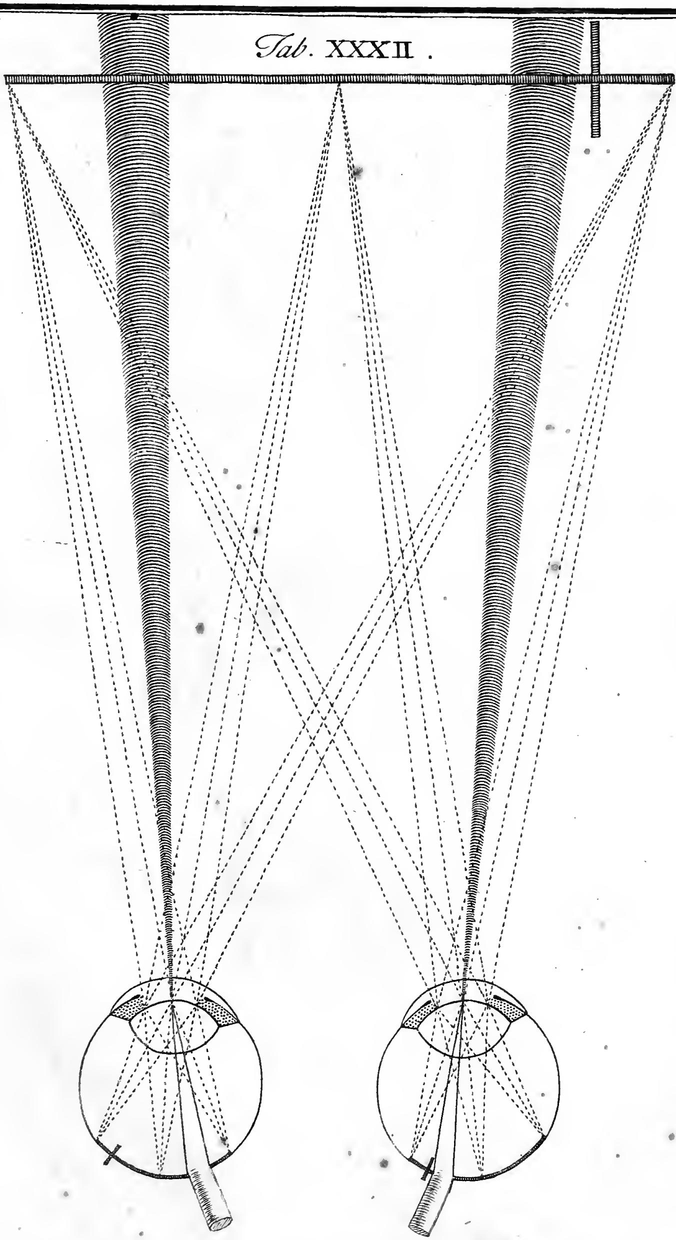
Tab. XXXII.



Tab. XXXIII.

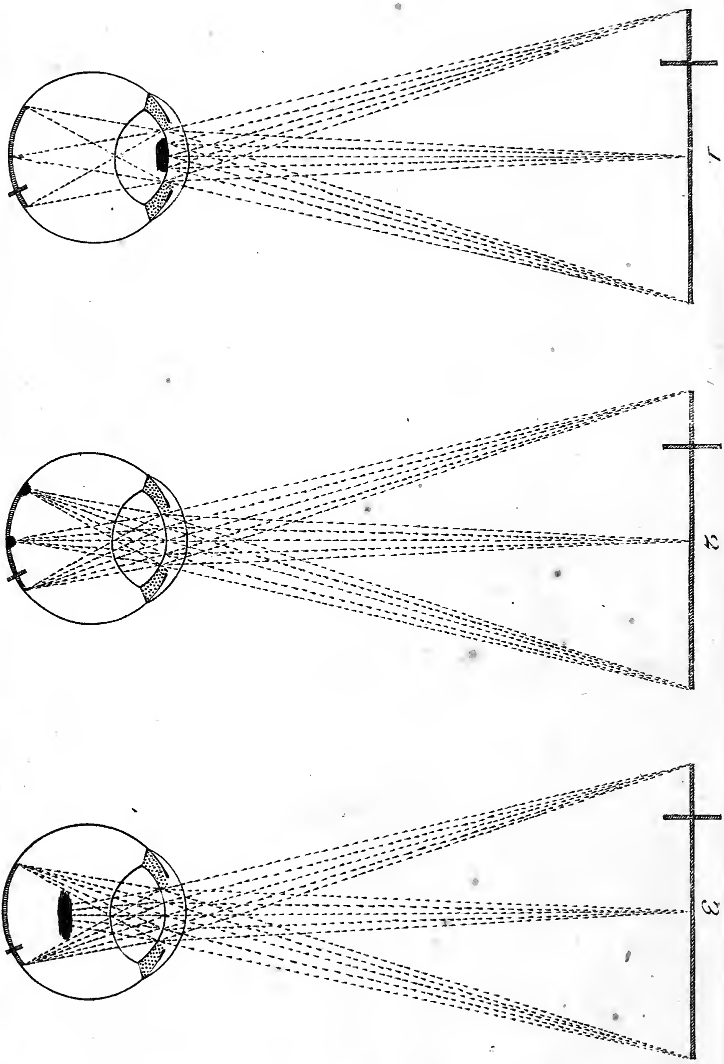


TABLE XXXIII.

FIG. 1

SHEWS what will be the effect of an opakeneſs, in the forepart of the cryſtalline humour.

FIG. 2

SHEWS what will be the effect, when parts of the Retina are not ſenſible of the light that falls upon them.

FIG. 3

SHEWS what will be the effect of opakeneſs in the vitreous humour.

BY conſidering the effects of diſeaſes within the eyes in this manner, the ſituation and extent of a diſeaſe in the eyes may, in moſt caſes, be known to great exactneſs.

TABLE XXXIV.

Fig. 1.

Shews how the light may be perceived only ſide-ways, when as much of the Tunica Cornea is become opake as lies before the pupil.

Fig. 2.

Shews how it happens that in the caſe of a cataract, which is a diſeaſe in the cryſtalline humour, light is perceived ſide-ways after viſion is quite loſt forwards.

TABLE

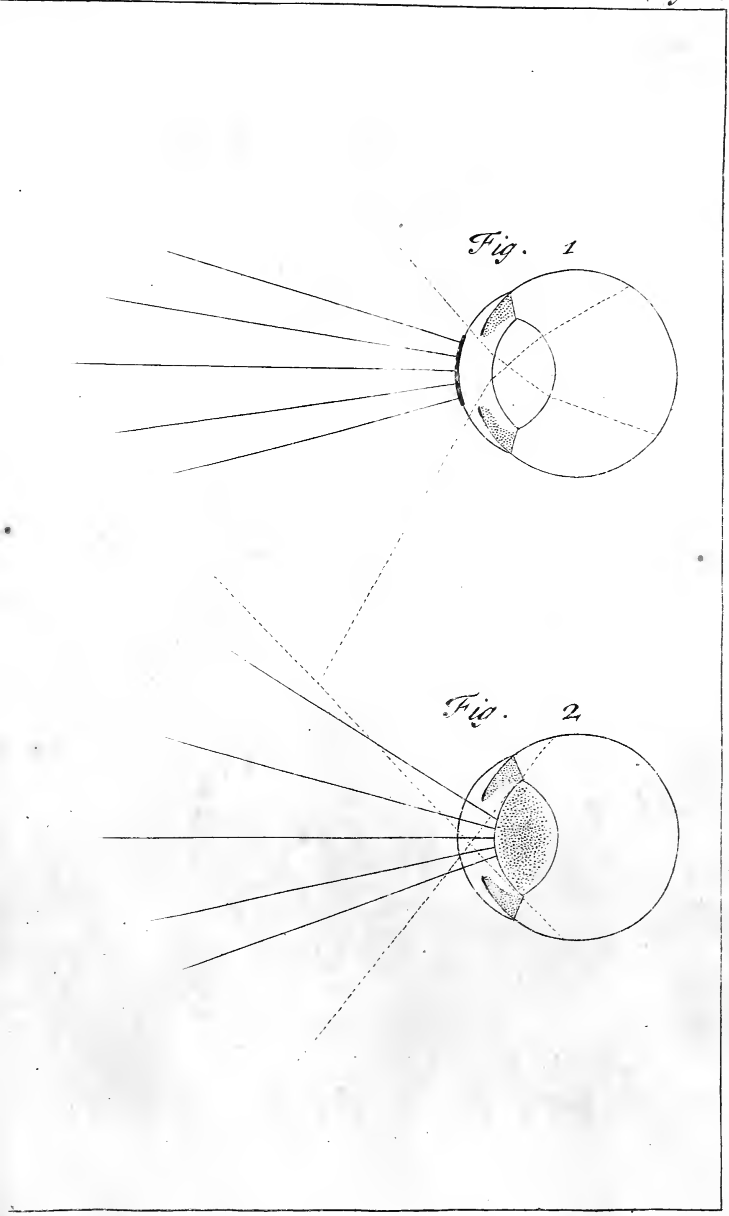


Fig. 1
Fig. 2

SYLLABUS,

SIVE

INDEX

Humani Corporis partium præcipuarum

ANATOMICUS,

In xxxv Prælectiones distinctus.

OSTEOLOGIA.

Prælectio Prima.

De Articulationibus & Structura Ossium.

Diarthrosis { Enarthrosis. Ginglimus.

Synchondrosis.

Synarthrosis, { Sutura. Gomphosis.

Prælectio Secunda.

De Ossium textura, Membranisque, &c.

In Textura sunt observanda { Fibræ. Partes { compactæ. spongiosæ.

Membranæ, { Pericranium. Periosteum. Glandulosæ Cellulas investientes. Medullam continentes.

edulla

- Medulla
  - adiposa.
  - sanguinea.
- De
  - Epiphysibus, & Apophysibus in genere.
  - Introitu & exitu Vasorum.
  - Ossium nutritione & incremento.

Prælectio Tertia.

De Suturis & Ossibus Cranii.

- Sutura
  - Coronalis.
  - Sagittalis.
  - Lambdoidalis.—— *Ossa Triquetra.*
  - Squamosa.
  - Transversalis.

Cæteræ ab Ossibus, quæ circumagunt, nominantur.

OS,

- Bregmatis.
- Frontis,
  - Spina.
  - Foramina.
  - Sinus.
- Ethmoides,
  - Crista Galli.
  - Foramina.
- Sphenoïdes,
  - Processus
    - Pterygoides
      - externus.
      - internus.
    - Innominatus.
    - Salpingoides.
    - Clinoides.
  - Sella Turcica.
  - Foramen
    - primum.
    - secundum, vel lacerum.
    - tertium.
    - quartum.
    - quintum.
  - Sinus Sphenoidalis.

Temporis,

Temporis, { Processus Mammillaris.
Processus e quo fit Os Jugale dictum.

Petrosum, { Foramen { sextum.
septimum.
Processus Styliformis.

Meatus auditorius, &c. *Vide*, *de Organis Auditus*. Præl. xxv.

Foramen octavum.

Occipitis, { Foramen { nonum.
decimum, vel magnum.
Apophyses duæ.

Foramina quædam Innominata.

Prælectio Quarta.

De Ossibus Faciei, & Maxillarum, &c.

OS,

Nasi.
Unguis,—— ductus ad Nasum.
Planum.
Malæ, vel Zygoma.
Palati,—— Foramina.
Vomer.
Spongiosum & septum Nasi quid.

Maxilla { Superior, { Alveoli.
Foramina.
Antrum.

Inferior, { Processus { Condyloides.
Coronalis.
Innominatus.
Foramina.
Alveoli.

- Dentes
  - Inciſorii.
  - Canini.
  - Molares.
  - Sapientiæ.

Prælectio Quinta.

De Oſſibus Trunci Corporis.

- Spina, ejus Vertebræ.
  - Colli 7. Atlas prima. Dentata ſecunda. Proceſſ. dentatus.
    - partes anteriores ſpongioſæ.
    - Proceſſus
      - Obliqui
        - ſuperiores.
        - inferiores.
      - Spinales bifurcati.
      - Tranſverſ. perforati.
  - Dorſi 12. Lumborum. 5.
    - partes anteriores ſpongioſæ.
    - Proceſſus
      - Obliqui
        - ſuperiores
        - inferiores.
      - Spinales.
      - Tranſverſales.
  - Sacri 5, vel 6.
    - Spinæ.
    - Foramina.
    - Proceſſus obliqui ſuperiores.
  - Coccygis 4, vel 5.
- Coſtæ 12.
  - veræ 7.
  - nothæ 5.
  - Apophyſes, & Sulci.
- Sternum
  - Oſſa Pectoris, plerumque tria,
  - Cartilago enſiformis.
  - Cartilagines ad Coſtas.
- Os Hyoides.

Prælectio

Prælectio Sexta.

De Offibus artus fuperioris.

OS,

Clavicula.

Scapula,
- Acetabulum.
- Proceffus
  - Coracoides.
  - Acromion.
- Cofta
  - Superior.
  - Inferior.
- Spina.
- Bafis.

Humeri,
- Caput.
- Apophyfis fuperior.
- Sulcus.
- Apophyfis { externus, internus, } inferior.
- Sinus.

Ulna,
- Olecranon.
- Proceffus Styloides.

Radius, —— Tuberculum.

Carpi { primi, fecundi } ordinis 4.

Metacarpi 4.
Pollicis 3.
Digitorum 12.

Prælectio Septima.

De Ossibus artus inferioris.

OS,

- Innominatum,
  - Ilium,
    - Spina.
    - Apex.
  - Ischium—Processus
    - obtusus.
    - acutus.
  - Pubis.
  - Acetabulum.
  - Foramen.
- Femoris,
  - Caput.
  - Trochanter
    - major.
    - minor.
  - Linea aspera.
  - Apophyses inferiores.
- Patella.
- Tibia, Apophyses.
- Fibula,——Appendix
  - superior.
  - inferior.
- Tarsi 7.
  - Astragalus.
  - Calcaneum.
  - Cuboides.
  - Naviculare.
  - Cuneiforme
    - majus.
    - medium.
    - minimum.
- Metatarsi 4.
- Pollicis pedis 3.
- Digitorum pedis 12.
- Sesamoidea.

Prælectio Octava.

De Ligamentis, & Cartilaginibus Capita ossium investientibus, & Glandulis Ossium, juncturis inservientibus: Etiam de his quibus Sceleton Viri, & Fœminæ Fœtus, & Adulti differunt.

De
- Ligamentis in genere.
- Ligamento terete.
- Cartilaginibus in genere.
- Glandulis juncturas lubricantibus.

ENTEROLOGIA.

Prælectio Nona.

De quibusdam Partium externarum integumentisque & Partibus constituentibus.

Mammæ, { Papillæ.
Areolæ.

Scrobiculus Cordis.
Regio Umbilicalis.
Hypochondria.
Hypogastrium.

Cæteræ partes externæ propriis Prælectionibus sunt demonstrandæ.

Cuticula.
Reticulum mucosum.
Cutis, { Papillæ Pyramidales.——Ungues.
Bulbi, unde procedunt —— Pili.
Glandulæ miliares, vel sudoriferæ.
Membrana adiposa.

Fibra.	Nervus.	Musculus.
Membrana.	Glandula.	Tendo.
Arteria.	Vas { Lacteum.	Os.
Vena.	Vas { Excretorium.	Cartilago.
Lymphæductus.		Ligamentum.

Prælectio Decima.

De Membranis totius Corporis.

Dura Mater.
Pia Mater.
Mediastinum.
Pleura.
Peritoneum, *&c.*

Prælectio Undecima.

De Glandulis salivalibus, earumq; ductibus.

Parotides, vel Maxillares superiores.
Maxillares inferiores.
Sublinguales.
Tonsillæ.
} earum ductus.

Membrana Glandularis oris, cujus Glandulæ nominantur
- Buccales.
- Labiales.
- Linguales.
- Fauciales.
- Palatinæ.
- Uvulares.

Prælectio Duodecima.

De Ductu Alimentali, & Membranis in Abdomine.

Peritoneum ——— Vasa Umbilicalia. *Vide* Præl. xxii.

 Omentum,

Omentum, { Ala, { ſuperior. / inferior. } / Burſa. }

Œſophagus.

Ventriculus,—orificum { ſiniſtrum, Cardia. / dextrum, ubi circulus fibroſus. }

Inteſtina tenuia, { Duodenum. / Jejunum. / Ilium. }

Inteſtina craſſa, { Colon, ubi Valvulæ ad ingreſſum. / Cæcum. / Rectum. }

In omni parte ductûs Alimentalis eſt notanda

Tunica { externa, Communis. / media, Muſcularis. / interna, Glanduloſa, Villo obducta. }

In { Ventriculo flaccido, Rugæ. / Inteſtinis { tenuibus, Valvulæ Conniventes. / craſſis, Cæco excepto, { Ligamenta. / Glandulæ. / Valvulæ. } } }

Meſenterium, —Glandulæ { Majores, *in Canibus Pancreas Aſſellii.* / Minores. }

In omnibus his membranis, ſunt obſervandæ Lamellæ.

Prælectio

Prælectio Decima Tertia.

De Hepate, Pancreate, Splene & Via lactea.

- Hepar,
  - Ligamentum
    - Suſpenſorium.
    - Latum.
    - Umbilicale.
  - Vena
    - Porta.
    - Cava.
  - Ductus Venoſus.
  - Veſica Fellea.
  - Vaſa excretoria, Ductus
    - Cyſticus.
    - Hepaticus.
    - Communis.
    - Choledochus.
- Pancreas —— Ductus excretorius.
- Splen,
  - Rete.
  - Cellulæ.

Prælectio Decima Quarta.

De quibuſdam Glandulis, & de Vaſis lacteis & lymphaticis.

- Venæ lacteæ, primi / ſecundi generis.
- Receptaculum chyli.
- Ductus Thoracicus.
- Lymphæductus in genere.
- Glandulæ
  - Vaſa ubique concomitantes.
  - Inguinales.
  - Axillares.

Prælectio Decima Quinta.

De Corde, & partibus Respirationi inservientibus.

Larynx,——Cartilago { Thyroides. Cricoides. Arytænoides. Epiglottis.

Bronchos,——Cartilagines, Pene-anulares.

Glandulæ Thyroideæ.

Thymus.

Pleura.

Mediastinum.

Pulmones, { Lobi. Lobuli.

Pericardium.

Cava { descendens. ascendens.

Tuberculum Loweri.

Cor {
- Auricula dextra { Columnæ. Foraminis ovalis locus. Ostium Venarum coronariarum.
- Ventriculus dexter, { Valvulæ tricuspides. Papillæ. Columnæ.
- Arteria Pulmonalis, { Valvulæ sigmoidales. Canalis arteriosus in Ligamentum versus.
- Vena Pulmonalis.
- Auricula sinistra,——Columnæ.
- Ventriculus sinister, { Valvulæ mitrales. Papillæ. Columnæ.
- Septum Cordis.

Aorta,

Aorta, { Valvulæ ſemilunares.
Oſtia Arteriarum coronariarum.

Prælectio Decima Sexta.

De Arteriis & Venis ſuperioribus.

Arteriæ.	Venæ.
Aorta aſcendens.	Jugulares, { externæ.
Coronariæ Cordis.	internæ.
Subclaviæ.	Rami communicantes.
Thymæ.	Ranulares.
Mammariæ.	Faciei.
Cervicales.	Parotides.
Carotides.	Laryngeæ.
Thyroideæ.	Thyroideæ.
Laryngeæ.	Mammariæ.
Temporales.	Thymæ.
Occipitales.	Occipitales.
Parotides.	Cervicales.
Ranulæ.	Subclaviæ.
Faciei.	Cava deſcendens.

Vaſa Cerebri. *Vide* Præl. xviii.

Axillaris.	Digitales.
Humeralis.	Cephalica.
Cubitalis { ſuperior.	Mediana.
media.	Baſilica.
inferior.	Humeralis.
Ramus communicans.	Axillaris.
Digitales.	

Prælectio Decima Septima.

De Arteriis, & Venis inferioribus.

ARTERIÆ.	VENÆ.
Aorta defcendens.	Digitales Pedis.
Intercoftales.	Saphæna.
Bronchiales.	Tibiales.
Phrenicæ.	Popliteæ.
Cœliaca.	Cruralis.
Pancreatica.	Epigaftricæ.
Hepatica.	Iliaca { externa. interna.
Cyftica.	Lumbares.
Coronaria Ventriculi fuperior.	Spermaticæ.
Epiploicæ.	Emulgentes.
Splenica.	Meferaicæ.
Coronaria Ventriculi inferior.	Coronaria Ventriculi inferior.
Mefenterica fuperior.	Splenica.
Emulgentes.	Epiploicæ.
Spermaticæ.	Coronaria Ventriculi fuperior.
Lumbares.	Cyftica.
Mefenterica inferior.	Hepatica.
Rami communicantes.	Pancreatica.
Sacra.	Porta.
Iliaca { externa. interna.	Phrenicæ.
Epigaftricæ.	Intercoftales.
Cruralis.	Bronchiæ.
Tibialis { anterior. media. pofterior.	Azygos in Cavam defcendentem.
Ramus communicans.	Cava afcendens.
Digitales Pedis.	Earum Valvæ.

Tunicæ, & Vafa Vaforum.

Prælectio Decima Octava.

De Cerebro, ejusque Membranis, & Vasis.

- Dura Mater
  - Processus
    - primus, (*i. e.*) Falx.
    - secundus.
    - tertius.
  - Sinus
    - Longitudinalis
      - super.
      - infer.
      - ubi Ligamenta. Torcular Herophili.
    - Laterales.
    - Rectus.
    - Circularis.
    - Innominati.

Cæteri non sunt semper observandi.

- Pia Mater
  - Arteriæ.
  - Venæ.
  - Volvuli.
- Cerebrum.
  - Hemispheria 2.
  - Lobi 4.
  - Arteriæ
    - Carotides.
    - Cervicales.
  - Infundibulum.
  - Glandula pituitaria.
  - Protuberantiæ 2 albæ pone infundibulum.
  - Medulla oblongata,
    - Crura.
    - Caudex.
    - Protuberantia annularis.
  - Nervorum par 1, 2, 3, 4, 5 seu
    - Olfactorium.
    - Opticum.
    - Oculorum motorium.
    - Patheticum.
    - Gustatorium.

Cere-

Cerebrum. Nervorum par 6, 7 seu Auditorium. 8 seu vagum. Accessorius Recurrens. 9, 10.

Cerebellum,—— Processus vermiformes.

Substantia { Corticalis cinerea. Medullaris alba.

Septum lucidum.

Fornix, { Radices. Crura.

Ventriculi 2 anteriores, { Plexus Choroides. Glandula Pinealis. Corpora striata. Thalami Nervorum opticorum Nates. Testes.

Foramen { ad Radices Fornicis. anterius. posterius.

Ventriculus tertius.

Ventriculus quartus. { Valvula. Pedunculi.

Quod de Cerebro superest vix notatu indignum judico.

Prælectio Decima Nona.

De Medulla Spinali & Nervis passim in Corpore dispersis.

Medulla Spinalis { Meninges. Cauda Equina. Nervor. pares { Cervicis 7. Dorsi 12.

Medulla

Medulla Spinalis { Nervor. pares { Lumborum 5. Sacri 6.

Brachiales.
Cubitales.
Digitales.
Intercostales.
Cruralis { anticus. posticus.
Tibiales.
Digitorum pedis.

Sunt plurimi ex his oriundi, & per Corpus undique dispersi; & a partibus quibus subserviunt nominantur.

Prælectio Vigesima.

De Partibus Urinariis, & Organis generationis in Viris.

Renes, { Arteriæ, Venæ } emulgentes. Glandulæ. Papillæ. Tubuli Urinarii. Pelvis.
Glandulæ Renales.—Sinus.
Ureteres.
Vesica urinaria, } Tunica { Externa communis. Media, *Musculus detrusor urinæ.* Interna.

Testes,

- Teſtes,
  - Tunicæ
    - Communes,
      - externa, Cutis.
      - interna, Dartos.
    - Propriæ
      - externa, Proceſſus Elythroides.
      - interna, Albuginea.
  - Arteriæ, Venæ — Spermaticæ.
  - Corpora varicoſa.
  - Epididymes.

Vaſa deferentia.

Veſiculæ ſeminales.

Proſtatæ.

- Penis,
  - Glans,
    - Præputium.
    - Frœnum.
    - Corpora cavernoſa.
    - Glandulæ odoriferæ.
  - Crura.
  - Corpora cavernoſa.
  - Septum.
  - Connexio ad Oſſa pubis, (*i. e.*) Ligamentum ſuſpenſorium.
  - Urethra.
    - Corpus cavernoſum.
    - Roſtra Gallinaginis.
    - Membrana Glandulofa.

Muſculi: Vide Præl. xxvi.

Prælectio

Prælectio Vigesima Prima.
De Partibus Generationis Mulierum.

Externæ,
- Mons Veneris.
- Rima Magna.
- Labia.
- Nymphæ.
- Clitoris,
  - Glans.
  - Præputium.
  - Crura.
  - Corpora cavernosa.
- Meatus Urinarii exitus.

Vagina,
- Hymen.
- Carunculæ myrtiformes.
- Rugæ.
- Glandulæ.
- Lacunæ.

Uterus,
- Ligamenta.
- Os Tincæ.

Tubæ Falloppianæ,
- Fimbriæ.
- Foramina.

Ovaria
- Arteriæ } spermaticæ.
- Venæ }
- Corpora varicosa.
- Ova.

Prælectio Vigesima Secunda.
De Fœtu in Utero, cum Membranis, &c.

Membrana
- Chorion.
- Allantois.
- Amnion.

Humores.

Humores.
Placenta Uterina.

Vasa Umbilicalia, { Vena. Arteriæ. Urachus.
Ductus venosus.
Foramen ovale.
Ductus arteriosus.

Prælectio Vigesima Tertia.

De Organis Tactus, Gustus, & Odoratus.

TACTUS.

Papillæ pyramidales in Cute. *Vide Præl.* ix.

GUSTUS.

Papillæ pyramidales in Lingua.

ODORATUS.

Membrana Glandulosa, & Nervea, passim inducta in Laminas Nasi, commune Os spongiosum dictum.

Prælectio Vigesima Quarta.

De Organis Visus.

Palpebræ cum Ciliis, & Superciliis.
Caruncula lachrymalis.
Ductus lachrymales.

Tunica

Tunica { Conjunctiva. Sclerotis. Cornea. Choroides. Uvea. Retina. Aranea. }

Processus Ciliares.
Iris.
Pupilla.

Humores, { Aqueus. Vitreus. Crystallinus. }

Prælectio Vigesima Quinta.

De Organis Auditus.

Auricula,
Meatus Auditorius.—Membrana Glandulosa.
Iter ad Palatum.
Tympanum.
Membrana Tympani.

Fenestra { ovalis. rotunda. }

Vestibulum.

Labyrinthus. { Cochlea. Canales tres semicirculares. }

Ossa, { Incus. Stapes. Malleolus. Ossiculum quartum. }

Musculus { externus, Tympani laxator. Obliquus internus } extensores. Obliquus externus } Stapidis. }

MYO-

MYOLOGIA.

Prælectio Vigeſima Sexta.

De Muſculis Abdominis, &c.

Faſcia tendinoſa, *vulgo* Membrana communis Muſculorum.
Membrana propria.

ABDOMINIS.

Obliqui { deſcendentes.
ascendentes. }
Pyramidales, — *ſæpe deſunt.*
Recti, — flexores.
Tranſverſales. } Compreſſores.

Cremaſteres Teſtium.
Erectores Penis:
Acceleratores Urinæ.
Erectores Clitoridis.
Sphincter Vaginæ.
Sphincter Ani.
Levatores Ani.

Prælectio Vigesima Septima.

De Musculis Faciei, Oculi, &c.

Frontis.

Occipito-Frontalis.
Retractor Auriculæ.

Palpebrarum.

Orbicularis.
Ciliaris, *est portio prioris.*
Aperiens Palpebram superiorem rectus.

Oculi.

Elevator.
Depressor.
Adductor.
Abductor.

Obliquus	superior, seu Trochlearis. inferior.

Faciei.

Sphincter Oris.

Elevator Depressor	Labii superioris proprius est	Dilatator Constrictor	alarum Nasi.
Elevator Depressor	Labii inferioris proprius.		
Elevator Depressor	Labiorum communis.		

Zygomaticus.
Buccinator.
Platysma Myoides.

Prælectio Vigesima Octava.

De Musculis Ossis Hyoidis, Linguæ, & Laryngis.

Ossis Hyoidis.

Mylohyoidei, Geniohyoidei, } sursum, antrorsumque.
Stylohyoidei,——sursum, retrorsumque.
Coracohyoidei,—— deorsum, retrorsumque.
Sternohyoidei,——deorsum.

Linguæ.

Genioglossi,——sursum, antrorsumque.
Styloglossi,——sursum, retrorsumque.
Ceratoglossi, Basioglossi } deorsum.

Laryngis.

Hyothyroidei —— elevatores }
Sternothyroidei, Cricothyroidei, } depressores. } Thyroidis.
Cricoarytœnoidei, { postici, laterales, }
Thyroarytœnoidei, } apertores } Arytœnoidis.
Arytœnoidei—clausores.

Prælectio

Prælectio Vigesima Nona.

De Musculis Maxillæ inferioris, Pharyngis, & Uvulæ.

MAXILLÆ INFERIORIS.

Digastricus, —— depressor.
Masseteres,
Temporales
Pterygoidei { externi, interni, } elevatores.

PHARYNGIS.

Stylopharyngei, —— dilatores.
Œsophagei, —— constrictores.
Vaginalis Gulæ.

UVULÆ.

Pterygostaphylini { externi, —— deorsum. interni, —— sursum.
Glossostaphylini.

Prælectio Trigesima.

De Musculis Claviculæ, Scapulæ, Humeri, & Cubiti.

CLAVICULÆ.

Subclavius.

SCAPULÆ.

Trapezius —— retrorsum.
Elevator.
Rhomboides, sursum, retrorsumque.

Serratus { major } anti- { antrorſum, ſurſumque.
minor } cus, { antrorſum, deorſumque.

Pectoralis, —— antrorſum.

Deltoides, }
Supraſpinalis, } ſurſum,

Infraſpinalis, retrorſum.

Teres { major.
minor *eſt por Muſc. infraſp.* } retrodeorſum.
Latiſſimus Dorſi. }

Coracobrachialis, —— ſurſum, extrorſumque.

Subſcapularis, —— introrſum.

CUBITI.

Biceps, }
Brachialis, } Flexores.

Triceps, }
Anconeus, } Extenſores.

Prælectio Trigeſima Prima.

De Muſculis Volæ Manus, Carpi, Pollicis, Digitorum, & Radii.

VOLÆ MANUS.

Palmaris { longus, *ſæpe deeſt.*
brevis, ſeu caro quadrata.

CARPI.

Flexor { Radialis.
Ulnaris.

Extenſor { Radialis, ſeu Bicornis.
Ulnaris.

Pollicis.

Pollicis.

Extenſor { primi / ſecundi / tertii } internodii.
Flexor { primi, & ſecundi Oſſis. / tertii internodii.
Adductor.
Abductor.

Digitorum.

Perforatus,——ſecund. }
Perforans,——tert. } internod. flexor.
Lumbricales,——primi }
Extenſor { Communis. / Indicis. / Auricularis.
Abductor { primi / minimi } digiti.
Flexor Oſſis Metacarpi minimi digiti.
Interoſſei,——extenſores, & divaricatores.

Radii.

Supinator { longus flexor verus cubiti. / brevis.
Pronator { teres. / quadratus.

Prælectio Trigeſima Secunda.

De Muſculis Capitis, & Colli.

CAPITIS.

Maſtoidei,
Recti { interni { majores / minores } ; laterales—utrinque. } flexores.

COLLI.

Longi,——flexores.
Scaleni.
Intertranſverſales.

CAPITIS.

Splenii.
Complexi.
Recti { majores / minores }
Obliqui { ſuperiores } extenſores.
Obliqui { inferiores.—rotatores.

COLLI.

Spinales
Tranſverſales } extenſores.
Interſpinales

Prælectio Trigeſima Tertia.

De Muſculis Dorſi, Lumborum, & Coſtarum.

DORSI.

Sacrolumbales
Longiſſimi. } extenſores.
Semiſpinales.

Lumborum

LUMBORUM.

Psoas parvus,——flexor *sæpe deest.*
Quadrati,——utrinque.
Coccygei.

COSTARUM.

Serrati { superiores, inferiores, } postici { levatores. depressores.

Intercostales { externi, interni, } levatores.

Triangulares, Diaphragma, } constrictores.

Prælectio Trigesima Quarta.

De Musculis Femoris, & Tibiæ.

FEMORIS.

Psoas magnus, Iliacus internus, Pectineus, Triceps, } flexores.

Gluteus { maximus, medius, minimus, } extensores.

Pyriformis, Marsupialis, } seu { Iliacus externus, Obturator internus, Quadratus. Obturator externus. } rotatores.

TIBIÆ.

Membranosus,——extensor extrorsum.

Sartorius, Gracilis, } flexor introrsumque.

Semitendinosus, Semimembranosus, Biceps, Popliteus, } flexores.

Rectus.
Vastus {externus, internus,} extensores.
Crureus.

Prælectio Trigesima Quinta.

De Musculis Tarsi, Pollicis, & Digitorum Pedis.

TARSI MUSCULI.

Gastrocnemius externus,
Plantaris, *sæpe deest*
Gastrocnemius internus, } extensores.

Tibialis {anticus,—flexor; posticus,—extensor} introrsum.

Peroneus {longus, brevis,} extensores extrorsum.

POLLICIS PEDIS.

Extensor {longus. brevis.}

Flexor {longus. brevis.}

Abductor.
Adductor.

DIGITORUM PEDIS.

Extensor {longus. brevis.}

Interossei—extensores.
Perforatus,—secund.
Perforans,—tert.
Lumbricales,—prim. } internod. flexores.
Transversalis Pedis—— constrictor.

FINIS.